Fermi National Accelerator Laboratory

FERMILAB-TM-1850

Data Collection for Groundwater Study

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Abstract

Supporting data for a recent groundwater study at Fermilab are collected together in one document, and are described in the context of how they were obtained and how they were used in the study.

Introduction

This document is a companion document to TM-1851, "Groundwater Migration of Radionuclides at Fermilab". That report is the result of a study of radionuclide propagation in groundwater in the subsoil at Fermilab, which included a contracted study of radionuclide concentrations in groundwater as it moves through soil from loss points to the bedrock aquifer. The latter study was performed by Woodward Clyde Consultants, Inc. (WCC) over the period December, 1992 to August, 1993, by a three person team led by project manager Phil Harvey[1].

This document includes the backup material used in the study described in TM-1851. It presents the data on borehole locations, well locations and water levels, and pump tests that was collected together as reference material for the WCC study. Much of the material concerning wells--both active and old farm wells--was compiled from material made available to us by R. Sasman, Illinois State Water Survey (retired), who served as a consultant over the period February, 1992 to September, 1993.

Borehole Information

The borehole information presented in Tables 4 and 5 contains the name, the depth, and the location of boreholes on the Fermilab site. Tables 4 and 5 are a useful guide for making selections from the collection of borehole logs, which have detailed geological information as a function of depth. The WCC study made use of this information by selecting a subset of borehole logs, which were subsequently used to determine the subsurface characteristics near the proton loss and dump points. The WCC study also made use of water level information from the borehole logs.

The list of boreholes presented here includes all the "B", "B0" series and those of the "S" series that are at least 40 feet in depth. In addition it includes the group S1108 to S1118, S1129 and S1130;

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[1] Summary of Radionuclide Transport Modeling for Ground Water at the Fermi National Accelerator Laboratory, Batavia, Illinois, August, 1993, Project Number 92C3073, WCC, 122 South Michigan Avenue, Suite 1920, Chicago, Il 60603.

these are near the site of the new main injector and are included because of their proximity to the site boundary and the MI 40 source point.

The borehole information comes from an accumulation of borehole data from Soil Testing Service, Inc. (STS), which has been under contract many years for making soil studies prior to construction work at Fermilab. We also compiled borehole data generated by the US Army Corps of Engineers and the US Geological Survey, both for the original National Accelerator Laboratory site and for the proposed siting of the SSC in the proximity of Fermilab.

Borehole Logs

The USGS borehole logs (at the Illinois State Water Survey in Champaign, Il) were large drawings that could not easily be duplicated or combined together in a book. At our request, R. Sasman had them copied to a more convenient size--on one of his trips to Champaign. At the end of the WCC study, we asked for the return of these borehole logs--assuming that they had no further use for them; they now are again at Fermilab. The same is true for the collection of STS borehole logs that was made for the groundwater study described in TM-1851.

Borehole Water Levels

Certain of the individual borehole logs note the presence of water and give the depth at which it was found. After an initial look at the information of Table 4 and the associated logs, WCC asked for lists of shallow boreholes that might provide further information on water levels in the glacial till. Table 5 was generated by looking at borehole logs for boreholes less than 40' deep, yet greater than 6' deep, and for the presence of information on the water level in the associated logs.

At the same time R. Sasman provided us with a tablulation of the depth of water in some of the STS borings[2]. The dates involved

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[2]The water levels are relatively near the surface and are described as "Piezometric Levels, Upper Perched Water Table in Relatively Pervious Surface Soils Overlying Glacial Till".

ranged from 8/12/68 to 4/10/69. To our knowledge, this particular information was not used in the WCC study. We do not include the tabulation in this Technical Memo.

Wells

A list of wells and some of their characteristics was compiled for the WCC study. It is given in their report as Table 3 and is reproduced here for reference. It gives the well identifier, the surface elevation, the well depth, the bottom elevation, and information about the water level. For the WCC study we asked the Fermilab survey group to more accurately determine the absolute elevation of the reference point at the well used for making the water level measurements (with a long tape). Prior information had relied on a topographic map of the site and an "eyeball" evaluation of the difference between the reference point elevation and the general surface in the immediate area.

As part of the survey, the DUSAF coordinates of the wells were measured. These are given in Table 6, together with the elevation of the reference point and a charactization of the well status.

Table 2 in TM-1851 lists the ten wells used as sources of drinking water. The other wells in our list are farm wells of varying age and construction. Although somewhat useful for determining water levels and monitoring for radionuclide presence, their construction is largely unknown and many will be sealed. A new network of monitoring wells is planned (to replace the existing wells). The WCC study recommended the installation of depth specific piezometer clusters (to establish the hydraulic gradient). In addition, WCC recommended making water level measurements on a routine basis over a one year period (to establish the seasonal variations of the hydraulic gradient). WCC also recommended that slug injection tests be performed on all new monitoring wells (to obtain the hydraulic conductivity of the surrounding medium).

Water Level Measurements

The well water levels given in Tables 7-12 are determined from measurements made over the years by the Illinois State Water Survey (usually with the personal participation of R. Sasman). We

TABLE 3.0
FERMI NATIONAL ACCELERATOR LABORATORY
RADIONUCLIDE TRANSPORT MODELING
GROUND WATER ELEVATIONS APRIL 1992.

WELL I.D.	SURFACE ELEVATION (FT MSL)	WELL DEPTH (FT)	BOTTOM ELEVATION (FT MSL)	WATER DEPTH (FT)	WATER ELEVATION (FT MSL)
B-54	787.19	117	670.19	89.60	697.59
B-59	741.06	82	659.06	57.78	683.28
BH-13	748.3	70	678.30	61.1	687.20
F-12	746.98	80	666.98	59.18	687.80
F-17a	742.4	114	628.40	56.8	685.60
F-19	745.28	115	630.28	58.02	687.26
F-20	746.89	120	626.89	61.32	685.57
F-23a	767.90	110	657.90	80.07	687.83
F-24a	753.50	100	653.50	66.30	687.20
F-24b	757.94	80	677.94	70.68	687.26
F-3	746.62	NA	NA	60.36	686.26
F-30	761.57	135	626.57	66.28	695.29
F-31a	799.83	210	589.83	107.96	691.87
F-39a	762.75	170	592.75	67.60	695.15
F-39c	759.44	20	739.44	1.60	757.84
F-45a	747.84	100	647.84	60.96	686.88
F-5	751.85	110	641.85	66.37	685.48
F-57	747.02	66	681.02	59.32	687.70
F-59	744.40	80	664.40	62.35	682.05
F-61b	734.48	70	664.48	42.89	691.59
F-62	732.86	261	471.86	58.00	674.86
F-64	736.39	90	646.39	49.00	687.39
F-65	766.15	165	601.15	74.46	691.69
F-68b	749.34	169	580.34	47.33	702.01
F-69	747.22	120	627.22	51.95	695.27
F-72	738.62	90	648.62	42.69	695.93
F-73	745.87	120	625.87	53.34	692.53
F-75b	738.80	80	658.80	34.90	703.90
F-76a	738.56	75	663.56	35.22	703.34
F-78	746.62	160	586.62	55.73	690.89
F-7b	751.81	122	629.81	65.51	686.30
F-8	755.34	68	687.34	68.76	686.58
FNAL-1	748.35	224	524.35	55.70	692.65
FNAL-2	743.81	326	417.81	58.37	685.44
FNAL-3	755.00	222	533.00	80.00	675.00
S-35	744.41	83	661.41	57.46	686.95

Note: Water levels were collected on April 20, 1992
NA= Data not available

made one further round of water level measurements in Spring, 1992, in order to have a recent value (at least for those wells that hadn't been deactivated). R. Sasman made the Spring, 1992 measurements, together with P. Kesich. Continuous monitoring was done with two chart recorders--one on a deep well and the other on a shallow well. The shallow well recorder was moved from well F39c to F39d in early 1988. Both these wells are in the vicinity of the parking lot of the Tony Frelo model airplane flying field, on old Wilson Road, west of the Meson Laboratory. Wells F39 c & d are the only ones that are shallow; they partially penetrate the glacial till[3].

The water levels as measured over the years are given in Table 7, for the wells without a chart recorder. The depth given is that below the reference surface used for taping. The measuring procedure involves chalking the tape in the region where water is expected, lowering the tape sufficiently into the well, noting the reading of the reference surface, pulling up the tape, and determining from the water's effect on the chalk where the water level mark is on the tape.

Tables 8-11 present the measurements of wells 39c and 39d, where there was a recorder present. The numbers recorded are the monthly tape reading, the maximum level for the month from the chart, and the minimum level for the month from the chart. It can be noted that the last chart reading for 39c corresponds to the end of December, 1987. After this date the recorder was moved to 39d. At the time of the compilation of the data, we only had the monthly taped readings from 39d. We did not have the monthly minima and maxima from the chart recorder.

Table 12 gives the taped levels and monthly minima and maxima from the chart recorder for well FNAL-2, which penetrates into the Dolomite aquifer.

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[3]F39a penetrates to the dolomite layer underlying the glacial till. The similarity in names of the F39 wells results from their general location, but was a source of confusion to WCC. Before this confusion was dispelled, the value for the vertical seepage velocity in the glacial till in the preliminary results of the WCC study was in error (but was correct in their final report).

Water Level Graphs

Figures 3 to 16 are graphs of the water level data. Each figure has several wells graphed. The wells were grouped by geographical proximity, for these figures. To keep the vertical scale reasonable, an average level was tabulated for each well and the quantity graphed is the deviation from the average. These graphs are meant to be a general guide to the behaviour of the water level data.

Figure 17 is a graph of the monthly taped measurements from the two shallow wells that had a recorder present. Level swings of 8' to 10' during the year are readily apparent.

Pump Tests

Pump tests were done at the time of construction of wells W-1 and W-3. If a pump test is done with constant flow, measurement of the change in water level in the well being pumped and in nearby observation wells can serve to supply values of the hydraulic conductivity of the medium being pumped, as well as the storage coefficient and the transmissivity. We obtained the description of the pump tests from R. Sasman. An analysis of them was made, and the resulting hydraulic conductivity became the "medium" value in Table 6 of TM-1851[4]. The analysis of the pump tests for each well follows.

On 12/19/69 pumping tests were conducted by running W-1 at Q = 530 gpm and using the following as observation wells: F-21, S-34, F-20, F-17, F-23, and S-35. The distance from W-1 to each well is 95 ft, 580 ft, 1150 ft, 2800 ft, 2825 ft, and 3570 ft respectively. Table 1 gives the drawdown in each well as a function of time for the

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[4] A confusion between the units of feet and meters for the drawdown on the graphs of drawdown vs $\frac{r^2}{t}$ led to the "medium" value of horizontal seepage velocity in Table 6 of TM-1851 (and in the WCC report) being low by a factor of 3.3 This error was realized between the publication of TM-1851 and the preparation of this report. The values of R(Mix) and R(Dolomite) in Table 8 of TM-1851 are also affected, since they depend on the "medium" value of the horizontal seepage velocity. Both the "high" and "low" values of horizontal seepage velocity shown in Table 6 of TM 1851 (and in the WCC report) are not affected by this confusion.

constant pumping rate of 530 gpm = 2 m^3/minute. F-20 drops 3.3 ft in the first minute of pumping and then diminishes. There may be a direct route between F-20 and W-1--the phenomena known as fingering caused by layered channels of high hydraulic conductivity. For this reason, F-20 compared to the other wells is always the one which is furthest from the "Theis curve" in the **s** vs. $\mathbf{r^2/t}$ plots.

On 6/10/70, similar tests were done by running W-3 at **Q** = 300 gpm using F-38 and F-65 as observation wells. The distance from W-3 to F-38 and F-65 is 950 ft and 2500 ft respectively. Table 2 gives the corresponding drawdown vs time for these wells.

Following the Theis method,[5] log-log plots of s(meter) vs. $\mathbf{r^2/t}$ ($meter^2$/minute) were made and overlayed with a log-log plot of **W(u)** vs. **u**. The Theis method takes the log-log plot of **s** vs. $\mathbf{r^2/t}$ and overlays it with a log-log plot of **W(u)** vs. **u**. Both plots must have the same number of decades on the corresponding axes. In ground water literature **W(u)** is known as the Theis well function, and **u** is a convenient variable that simplifies the differential equation which describes radial flow. Keeping the axes of the two plots parallel, one plot is superimposed on the other to set the absolute scale, and an arbitrary "match point" (not necessarily on the curves) is selected. Most often one chooses **W(u)** = 1. and **u** = 0.01 on one plot. The corresponding match point on the other plot (s, r^2/t) is found by asking what value does s have when **W(u)** = 1., and what value does $\mathbf{r^2/t}$ have when **u** = 0.01. One then has four values

W(u) = 1.	**u** = 0.01
s = y0	$\mathbf{r^2/t}$ = x0

The transmissivity, **T**(m^2/min) can be extracted using,

$$T = \frac{Q * W(u)}{4\pi * s}$$

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[5]David B. McWhorter and Daniel K. Sunada, Ground-Water Hydrology and Hydraulics (Fort Collins, Colorado: Water Resources Publications, 1977), 177-207.

For W-1, superimposing the plots at t=100 minutes, t=410 minutes and t=1440 minutes gave s = 1 meters, and T = 0.15 m^2/min (see Figure 1). For W-3 the plots at t=100 minutes, t=610 minutes, and t=1400 minutes gave an average s of 0.5 meters, and an average T = 0.18 m^2/min (see Figure 2). The results from both pump tests are remarkable similar. Taking the value from W-1, we calculate the hydraulic conductivity in the dolomite from T and b (the saturated thickness of the aquifer). The latter was determined by Woodward-Clyde Consultants to be 44 meters.[6]

$$K = \frac{T}{b} = \frac{0.15\ \mathrm{m^2 / min}}{44\ \mathrm{m}} = 1790\ \mathrm{m / yr}$$

[6]Woodward-Clyde Consultants, Summary of Radionuclide Transport Modeling for Ground Water at the Fermi National Accelerator Laboratory, Batavia, Illinois, Project Number 92C3073, August 1993, Table 4.

Table 1

W-1 Pumping at 530 gallons per minute.
Time versus drawdown for each well

Time (min)	W-1 (ft)	F-21 (ft)	S-34 (ft)	F-20 (ft)	F-17 (ft)	F-23 (ft)	S-35 (ft)
1.0	15.00	0.14	0.49	3.31		0.00	
2.0	17.00	0.93	1.18			0.00	
3.0	17.00		1.76			0.01	
4.0	17.00		2.20	3.99		0.01	
5.0	17.00	1.18	2.55			0.02	
6.0	18.00	1.23	2.85	5.22		0.02	
7.0	18.00		3.11			0.03	
8.0	19.00	1.59	3.36	5.66		0.04	
9.0	19.00		3.59			0.04	
10.0	19.00	1.71	3.79	5.51		0.05	
20.0	22.00	4.45	5.28	6.45		0.14	
30.0	22.00	6.84	6.18	7.21		0.22	
40.0	24.00	8.66	6.95	7.28		0.29	
50.0	25.00	9.76	7.56	7.35		0.36	0.00
60.0	27.00	12.64	7.94	6.70		0.42	0.01
70.0	28.00	14.54	8.25	7.10		0.47	0.01
80.0	28.00	15.33	8.49	7.45		0.51	0.01
90.0	28.50	16.13	8.69	7.75		0.54	0.01
100.0	29.00	16.05	8.85	7.85	0.29	0.58	0.02
240.0	31.00	16.33	9.78	8.90	0.51	0.82	0.05
410.0	37.00	16.71	10.30	9.50	0.72	1.19	0.18
515.0	37.00	16.68	10.40	9.70	0.86	1.27	0.24
655.0	37.00	17.24	10.55	9.80	1.00	1.42	0.33

Table 2

W-3 Pumping at 300 gallons per minute.
Time versus drawdown for each well

Time (min)	W-3 (ft)	F-38 (ft)	F-65 (ft)
10.0	11.50	0.24	0.00
30.0	13.00	0.62	0.00
40.0	13.00	0.75	0.01
50.0	13.50	0.81	0.01
60.0	13.50	0.93	0.02
70.0	14.00	0.98	0.03
80.0	14.50	1.02	0.03
90.0	14.50	1.14	0.04
100.0	15.00	1.17	0.04
320.0	15.00	1.97	0.21
610.0	16.00	2.13	0.38
900.0	18.00	2.37	0.56
1400.0	29.00	2.54	0.72

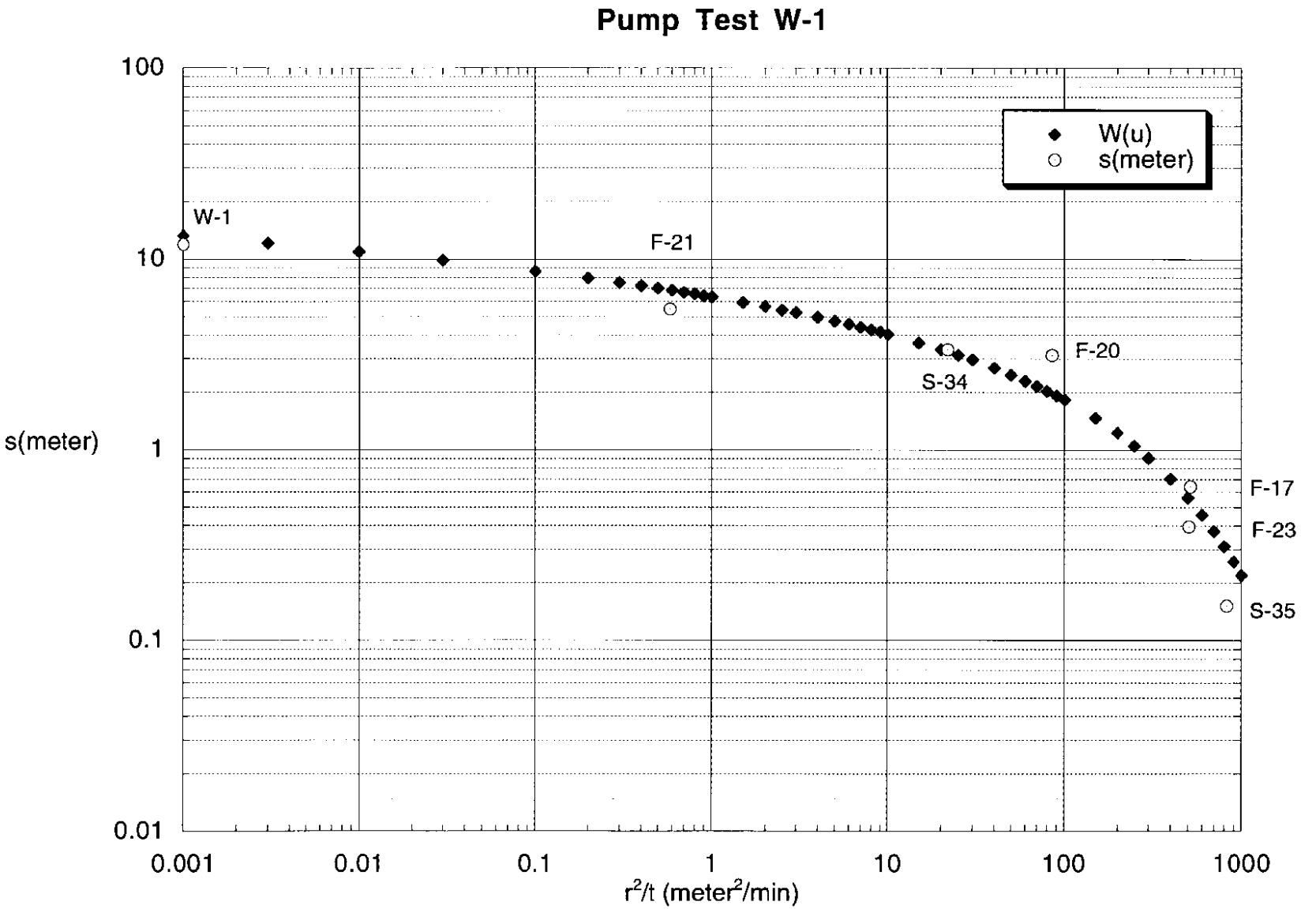
Pump Test W-1
100
10
1
0.1
0.01
s(meter)
0.001
0.01
0.1
1
10
100
1000
r²/t (meter²/min)
W(u)
s(meter)
W-1
F-21
S-34
F-20
F-17
F-23
S-35

Fig. 1

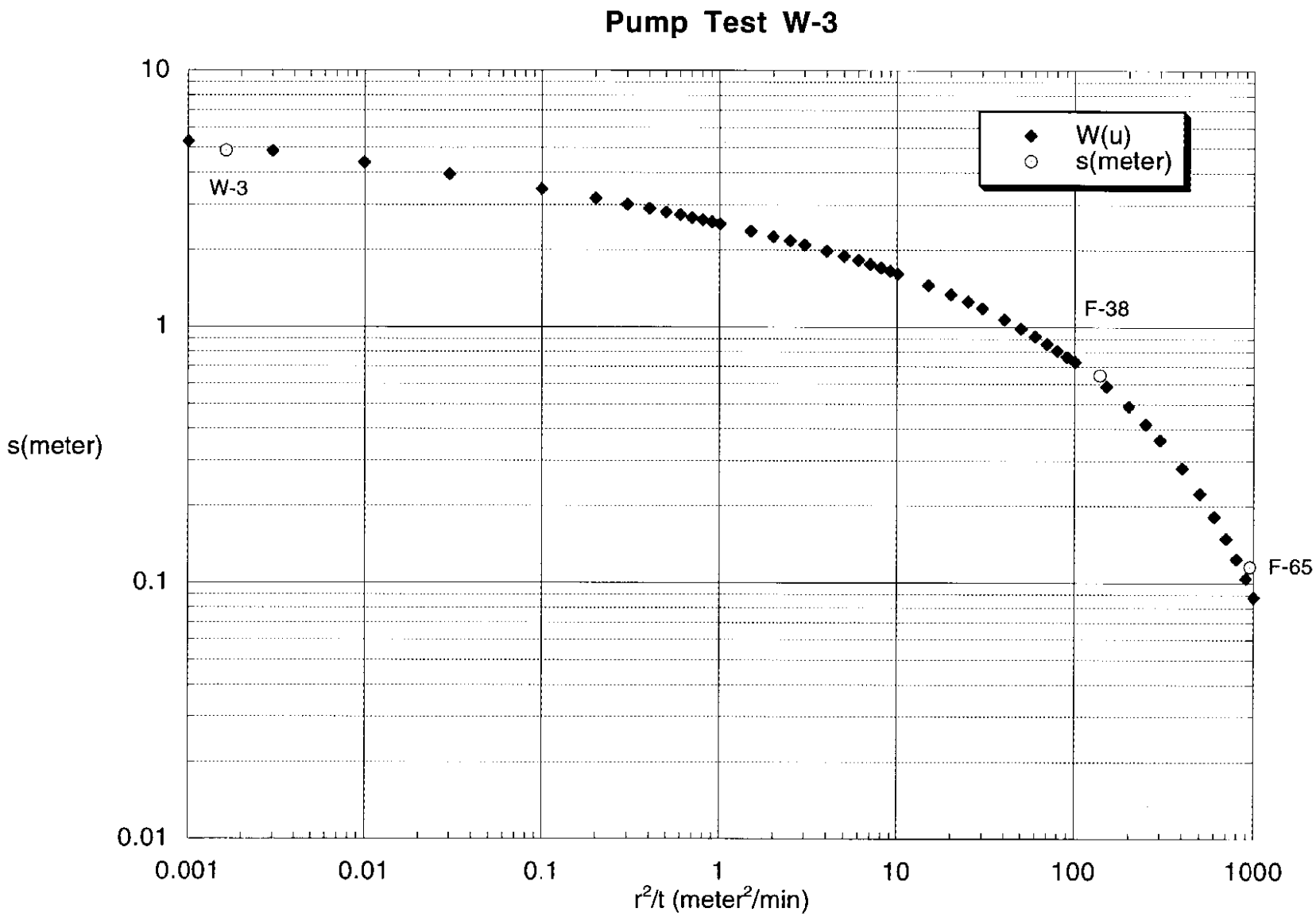
Pump Test W-3
10
1
0.1
0.01
s(meter)
W(u)
s(meter)
W-3
F-38
F-65
0.001
0.01
0.1
1
10
100
1000
r²/t (meter²/min)

Fig. 2

Table 4 - Bore Hole Logs
Elevation[ft], Depth[ft], Y(DUSAF)[ft], X(DUSAF)[ft])

TM 1850

B1	765.9	107.4	93071.1	97746.2
B2a	742.0	93.0	100930.4	102908.9
B2b	740.0	86.5	98528.9	100100.3
B3	741.0	92.8	103093.4	105942.3
B4	734.0	98.6	107940.3	109760.1
B5	753.0	104.5	89744.9	101159.6
B6	750.0	102.0	93070.6	104293.5
B7	743.0	108.7	100155.2	110623.6
B8	720.0	81.5	104994.8	116149.6
B9	749.0	85.7	102472.0	93192.8
B10	741.0	83.4	108324.6	99577.2
B11	739.0	95.0	111695.4	103692.1
B12	730.0	95.0	114985.8	107781.9
B14	775.0	110.9	96718.5	93051.6
B15	759.0	91.5	101140.0	91977.1
B16	746.3	87.7	105028.5	99656.4
B17	738.0	80.0	107308.3	107134.2
B18	750.0	97.5	95949.5	106916.7
B19	741.0	92.1	96393.8	102323.1
B20	774.0	49.5	92131.5	99195.4
B21	733.1	98.4	91453.4	102894.1
B22	738.0	49.9	94950.6	103359.4
B23	748.0	96.5	94274.6	105435.9
B24	750.0	74.4	98075.0	108594.1
B25	738.7	78.0	101155.2	111571.7
B26	740.0	52.0	103019.4	113438.1
B28	738.0	56.8	101407.0	108348.7
B29	742.0	50.0	97733.1	101252.4
B30	744.0	50.0	99719.2	101747.9
B31	746.0	49.1	100064.9	102108.5
B32	741.0	55.2	105289.0	104469.7
B33	731.4	59.8	108171.7	111933.2
B34	741.0	64.0	106301.1	103798.0
B35	750.0	55.5	106033.2	101161.8
B36	742.4	59.0	105333.6	99631.0
B37	765.0	50.0	103872.1	97430.2
B38	757.0	95.3	104467.4	96119.5
B39	742.0	83.7	106981.0	98430.4
B40	745.0	60.0	109993.8	101904.7
B41	725.9	68.5	113225.2	105805.9
B42	735.0	66.3	113708.5	103905.5
B43	735.0	50.0	110168.1	98091.5
B45	745.0	50.0	102859.5	101626.0
B46	743.9	66.0	101089.5	102826.1
B48	739.1	72.6	96212.4	102481.0
B49	756.1	74.0	104624.1	96060.0
B50	733.8	88.8	94889.8	99961.7
B51	753.3	77.2	98916.0	96522.6
B52	775.0	88.0	102928.8	97306.6
B53	740.5	67.0	99147.6	104965.0
B54	786.7	116.8	101407.8	94957.4
B55	748.7	70.0	100803.9	98836.6
B56	739.0	63.1	97313.4	105559.0
B57	739.0	58.5	99844.7	106322.6
B58	743.0	66.0	102296.3	104752.0
B59	740.4	82.0	103969.2	102929.9
B60	748.7	52.5	106198.6	94756.5
B61	735.3	53.5	108406.0	96534.2
B62	729.0	56.4	111707.1	100099.9
B63	731.0	82.0	113275.4	102544.0
B64	744.0	68.0	107634.9	103527.7
B65	736.8	66.5	109082.7	105585.3
B66	718.7	52.0	110751.8	107854.7
B67	725.8	66.0	109289.0	109118.3
B68	736.5	70.5	105363.4	108410.7
B69	741.9	106.6	103166.7	110138.9
B70	725.6	73.0	105008.5	112435.6
B0-2	746.0	51.5	101502.0	102836.0

Table 4 - Bore Hole Logs
Elevation[ft], Depth[ft], Y(DUSAF)[ft], X(DUSAF)[ft])

TM 1850

B0-6	742.0	52.0	101717.0	102909.0
B0-7	739.9	52.0	101765.0	102873.0
S1	736.1	87.0	102416.0	105405.5
S2	736.7	79.0	103131.2	103929.4
S3	736.0	80.5	103194.7	103496.5
S4	745.9	80.0	101700.3	100543.8
S5	747.1	84.4	99868.9	100012.5
S6	741.8	75.5	98025.9	100601.9
S7	739.9	85.5	96615.2	103326.2
S8	739.8	86.0	97020.7	104872.1
S9	737.7	81.0	97452.4	105483.9
S10	741.6	86.0	98195.0	106114.1
S11	739.0	82.5	98773.7	106379.3
S12	742.8	80.5	99790.8	106573.3
S13	733.5	84.0	100890.7	106439.2
S14	740.4	78.0	96886.0	101915.5
S15	741.3	73.5	97551.4	100994.6
S16	742.2	76.0	99150.0	99773.0
S17	743.6	79.0	99245.9	99538.0
S18	742.5	77.0	99492.2	99545.8
S19	743.0	78.0	99612.9	99765.6
S20	745.8	80.0	99534.8	100017.8
S21	745.0	78.0	99768.0	99564.8
S23	744.0	78.0	100139.1	99308.0
S24	743.6	76.0	99769.5	99658.1
S25	743.8	78.0	99700.9	99770.1
S26	744.3	78.0	99859.1	99767.6
S27	744.7	78.0	99982.2	99765.6
S28	745.2	78.0	99774.2	99955.7
S29	747.5	86.0	100929.8	100013.3
S30	749.0	86.0	101410.6	100017.4
S32	744.8	81.0	99277.5	100056.9
S34	742.5	75.5	98589.4	100283.7
S35	741.7	86.0	100137.0	103100.1
S55	742.6	46.5	99390.3	99775.0
S56	743.0	46.5	99274.7	99876.0
S57	743.3	46.5	99283.1	99665.8
S78	743.0	56.5	99159.1	98494.8
S80	744.9	56.5	99127.8	97631.5
S82	749.1	56.5	98542.6	98061.0
S84	744.2	56.5	97970.4	98571.9
S87	744.0	56.5	99030.3	98135.0
S89	741.5	56.5	98457.6	98616.7
S200	774.0	94.0	103042.2	96811.0
S201	767.4	89.0	103481.1	97136.7
S202	776.0	98.5	102969.8	96677.9
S203	782.0	106.0	102274.8	96467.2
S204	770.0	89.0	102744.5	96144.6
S213	744.4	52.0	102257.9	100593.4
S214	739.6	62.0	103179.1	100281.2
S215	747.1	52.0	104073.5	100494.7
S216	749.4	72.0	104969.9	100842.3
S217	740.0	52.0	97961.3	99213.9
S218	739.0	52.0	98257.2	99479.9
S221	749.4	41.5	103421.9	99380.4
S224	732.5	40.0	113698.5	100359.4
S227	745.6	51.0	102695.2	100851.5
S228	746.5	51.5	102691.5	100616.2
S229	742.0	51.5	102989.0	100611.4
S230	744.4	50.8	102987.0	100858.7
S231	741.8	48.9	103150.0	101003.2
S244	779.3	96.5	102522.0	96675.7
S245	773.0	86.0	102227.9	95774.0
S246	766.0	77.5	103494.5	95701.0
S247	741.0	75.0	103478.1	100297.7
S254	750.7	85.0	104399.4	100595.0
S271	750.7	85.8	105192.6	100700.1
S276	743.7	76.5	103485.2	99997.4

Table 4 - Bore Hole Logs
Elevation[ft], Depth[ft], Y(DUSAF)[ft], X(DUSAF)[ft])

TM 1850

S285	745.1	75.0	104074.5	99623.2
S291	745.3	78.5	105046.8	99384.1
S295	743.0	72.0	105963.0	99357.9
S298	745.3	52.0	100373.5	99693.6
S299	743.3	76.0	100195.4	99719.9
S300	743.2	52.0	100191.3	99837.7
S301	743.6	52.0	100269.8	99907.1
S302	747.1	85.0	100359.1	99911.6
S303	744.0	50.0	100429.3	99833.9
S355	763.0	52.0	106996.8	99994.8
S357	744.3	77.0	108101.0	100004.9
S358	742.0	67.0	108160.8	100205.8
S375	-0-	45.0	88538.0	94857.0
S510	755.0	42.0	99985.0	105137.0
S515	741.7	65.5	94628.9	101931.0
S516	743.8	70.0	99962.0	105522.0
S670	744.0	71.0	105888.0	100394.0
S671	744.0	51.5	106037.0	100407.0
S672	744.0	51.5	106114.0	100408.0
S700	746.0	73.0	102848.0	101675.2
S701	745.2	57.0	102783.7	101713.8
S702	745.5	84.0	102766.4	101672.8
S703	746.4	81.0	102814.0	101662.3
S704	745.2	83.0	102879.7	101637.3
S834	750.0	40.0	97717.3	100828.2
S847	744.3	42.0	103167.8	101143.1
S848	745.7	40.0	103143.6	101211.9
S849	747.2	40.0	103265.9	101235.4
S850	747.7	40.0	103214.2	101298.5
S851	744.7	40.0	103348.4	101312.4
S852	746.7	40.0	103314.5	101398.9
S864	741.0	47.0	98613.0	99520.0
S865	742.0	47.0	98775.0	99740.0
S866	742.0	47.0	98620.0	99925.0
S867	739.5	47.0	98265.0	99727.0
S868	744.0	52.0	98250.0	100140.0
S869	745.0	51.5	97935.0	100580.0
S874	755.4	45.0	107740.0	100001.0
S892	742.6	50.0	109474.4	100235.9
S893	742.2	50.0	109466.8	100304.8
S894	743.5	50.0	109225.0	100211.2
S895	742.8	50.0	109217.4	100280.1
S896	743.4	82.0	109270.0	100248.1
S897	742.4	79.0	109434.1	100266.5
S898	743.2	50.0	109142.2	100235.6
S903	743.0	74.5	109281.3	100226.3
S904	743.0	82.0	109258.7	100229.2
S920	748.5	51.5	107161.4	100683.6
S921	750.3	51.5	107154.7	100732.9
S922	747.2	71.0	107273.5	100732.1
S923	743.6	46.5	107382.6	100715.3
S924	743.6	46.5	107375.9	100764.6
S929	744.5	56.5	106036.0	100519.4
S930	744.0	56.5	105920.3	100558.2
S973	744.7	45.0	106738.0	99130.0
S977	744.9	44.5	106762.0	99127.0
S996	744.0	65.0	99838.6	106492.3
S997	-0-	74.0	99890.5	106494.4
S998	743.4	64.3	99869.7	106542.6
S999	741.7	76.0	99868.5	106592.3
S1000	740.4	63.3	99864.8	106642.2
S1001	742.8	74.8	99819.8	106578.6
S1002	742.2	62.5	99933.6	106556.9
S1003	740.4	60.5	99929.5	106657.2
S1024	745.2	50.0	102406.0	100551.0
S1025	744.7	50.0	102337.0	100636.0
S1026	745.6	68.5	102286.0	100523.0
S1027	745.9	50.0	102231.0	100431.0

Table 4 - Bore Hole Logs
Elevation[ft], Depth[ft], Y(DUSAF)[ft], X(DUSAF)[ft])

TM 1850

S1028	745.9	50.0	102175.0	100500.0
S1029	746.4	68.0	102155.0	100400.0
S1030	746.3	50.0	102231.0	100342.0
S1031	746.7	50.0	102135.0	100300.0
S1032	746.0	50.0	102265.0	100272.0
S1054	746.0	55.0	102628.5	100888.0
S1100a	749.6	44.0	99611.0	99568.0
S1108	740.8	38.0	97139.0	101522.5
S1109	740.8	38.0	97023.2	101708.2
S1110	738.9	31.0	95680.3	102536.5
S1111	734.8	27.0	94507.7	101833.2
S1112	732.0	19.0	94277.0	101298.0
S1113	735.7	27.5	94269.5	100647.9
S1114	738.9	31.0	94533.2	99943.9
S1115	739.6	32.0	95105.9	99199.6
S1116	746.1	38.0	96102.9	98802.4
S1117	740.0	32.0	97277.4	99564.7
S1118	742.5	34.5	97504.3	100554.0
S1122	740.0	50.0	97364.0	101092.0
S1122a	740.0	46.5	97364.0	101092.0
S1123	740.0	52.5	96797.0	101990.0
S1124	740.0	50.0	96066.0	102480.0
S1125	738.0	44.5	94696.0	99676.0
S1126	739.0	42.5	96735.0	98980.0
S1127	738.2	44.0	96198.0	103406.0
S1128	745.5	46.0	96408.0	103618.0
S1129	742.0	35.0	97771.0	100071.0
S1130	743.0	35.0	98708.0	100065.0
S1131a	742.0	50.0	97138.0	101739.0
S1141	741.4	45.0	96764.0	102024.0
S1142	739.4	45.0	96727.0	102058.0
S1143	740.0	45.0	96872.0	101910.0
S1144	741.0	45.0	96830.0	101952.0
S1145	735.3	40.0	94980.0	102322.0
S1146	737.5	40.0	94345.0	100255.0
S1147	738.5	49.0	95608.0	98870.0
S1148	741.0	46.0	97443.0	99933.0

Table 5 - Shallow Bore Hole Logs
(Name, Depth[ft], Eltop[ft],Y(DUSAF)[ft], X(DUSAF)[ft])

TM 1850

B0-1	27.0	745.0	101519.00	102800.00
S37	35.0	746.9	100732.07	100109.78
S38	31.5	747.2	101250.81	100294.16
S39	25.0	740.5	102085.68	100823.71
S40	31.5	745.3	102581.02	101381.96
S41	25.0	744.7	103109.39	102546.63
S42	32.0	743.6	102879.52	104692.02
S43	30.0	734.9	101786.26	105987.35
S44	32.0	737.1	100318.05	106553.29
S45	32.0	745.6	99215.23	106500.69
S46	30.0	740.6	98525.98	106283.98
S47	31.0	739.7	97809.34	105816.76
S48	32.0	739.7	97195.22	105161.17
S49	32.0	739.5	96807.72	104379.45
S50	32.0	739.1	96677.47	103926.31
S51	30.0	740.2	96537.99	102889.73
S52	32.0	743.0	98886.47	100162.28
S222	37.0	742.0	106403.50	99362.65
S282	27.0	748.1	102233.66	99893.63
S286	27.0	744.6	104234.58	99585.34
S290	27.0	746.1	105025.42	99537.49
S292	27.0	745.1	105146.56	99294.28
S293	27.0	743.9	105391.74	99366.91
S296	27.0	740.9	106050.00	99215.23
S309	6.7	740.0	104434.48	102436.54
S360	10.2	744.0	103357.33	101317.73
S489	32.0	743.0	105512.62	100473.87
S666	6.0	769.6	103408.05	97403.80
S667	6.0	768.3	103405.37	97618.98
S837	30.0	744.0	97739.23	100854.66
S838	30.0	743.2	97789.33	100805.40
S839	30.0	743.2	97835.58	100759.33
S853	20.0	742.7	103285.69	100954.37
S854	20.0	743.5	103430.70	100994.77
S855	20.0	741.4	103543.50	101088.90
S856	20.0	744.4	103667.09	101275.30
S857	20.0	746.5	103452.24	101013.20
S1111	27.0	734.8	94507.71	101833.21
S1115	32.0	739.6	95105.91	99199.60
S1118	34.5	742.5	97504.31	100554.02

Table 6 - Well Information
Well Name, Elevation[ft], Y(DUSAF)[ft], X(DUSAF)[ft], Status

TM 1850

B-54	787.190	101292.	95079.1	ACTIVE
B-59	741.060	104274.	103135.	INACTIVE
BH-13	748.330	98170.2	100341.	ACTIVE
BH-15	739.800	96707.3	99979.4	ACTIVE
F-12	746.980	94526.1	104011.	ACTIVE
F-17A	742.440	97143.8	101916.	ACTIVE
F-19	745.280	98170.3	101209.	ACTIVE
F-20	746.890	98588.0	100815.	ACTIVE
F-23A	767.900	98451.1	96966.1	ACTIVE
F-24A	753.490	97140.9	98045.2	ACTIVE
F-24B	757.940	96698.0	98119.6	ACTIVE
F-3	746.620	100663.	110407.	ACTIVE
F-30	761.570	103444.	94686.2	ACTIVE
F-31A	799.830	100620.	95874.2	INACTIVE
F-39A	762.750	104567.	98352.0	ACTIVE
F-39C	759.440	104611.	98391.1	INACTIVE
F-39D	763.490	104629.	98235.3	INACTIVE
F-43	748.850	103270.	101416.	ACTIVE
F-45A	747.840	100818.	103049.	ACTIVE
F-49	749.890	106144.	100145.	ACTIVE
F-5	751.850	98839.9	107298.	ACTIVE
F-57	747.020	101085.	108406.	ACTIVE
F-59	744.400	106537.	104549.	ACTIVE
F-61B	734.480	107078.	107700.	ACTIVE
F-62	732.860	108505.	106725.	INACTIVE
F-64	736.390	107567.	109531.	ACTIVE
F-65	766.150	104920.	96899.2	ACTIVE
F-68B	749.340	110088.	101632.	ACTIVE
F-69	747.220	111110.	103265.	ACTIVE
F-72	738.620	112464.	104709.	ACTIVE
F-73	745.870	113253.	105442.	ACTIVE
F-74	738.280	113312.	106041.	INACTIVE
F-75B	738.800	109487.	98872.8	ACTIVE
F-76A	738.560	110113.	98405.8	ACTIVE

Table 6 - Well Information
Well Name, Elevation[ft], Y(DUSAF)[ft], X(DUSAF)[ft], Status

TM 1850

F-78	746.620	103859.	99653.6	ACTIVE
F-79	752.530	103907.	99543.5	INACTIVE
F-7B	751.810	96583.9	106922.	ACTIVE
F-8	755.340	95509.6	105789.	ACTIVE
FNAL-1	748.350	98884.4	99724.6	ACTIVE
FNAL-2	743.810	103472.	101142.	INACTIVE
FNAL-3	755.000	102977.	98817.0	INACTIVE
S-35	744.410	100182.	103099.	ACTIVE

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

B-54	11/15/68	91.7	B-54	4/20/92	89.6	B-69	6/23/81	37.8
B-54	12/14/68	89.5	B-59	11/15/68	57.2	BH-13	3/03/78	56.4
B-54	1/10/69	97.5	B-59	12/14/68	55.8	BH-13	10/11/79	56.1
B-54	3/10/69	89.5	B-59	1/10/69	55.0	BH-13	6/16/80	57.6
B-54	4/10/69	88.1	B-59	3/10/69	54.0	BH-13	6/22/81	55.0
B-54	6/03/69	86.2	B-59	4/10/69	53.9	BH-13	6/24/82	55.9
B-54	6/16/69	85.8	B-59	6/17/69	52.4	BH-13	6/08/83	54.6
B-54	12/07/70	88.7	B-59	9/10/69	52.5	BH-13	7/15/86	58.4
B-54	3/30/71	87.9	B-59	5/28/70	51.7	BH-13	6/01/87	59.7
B-54	3/31/71	87.6	B-59	12/07/70	55.2	BH-13	4/20/92	61.1
B-54	4/26/71	88.3	B-59	3/30/71	53.9	BH-14	3/03/78	51.1
B-54	8/03/71	93.2	B-59	3/31/71	53.9	BH-14	6/06/79	53.3
B-54	8/06/71	93.2	B-59	4/26/71	53.3	BH-14	10/11/79	53.7
B-54	12/22/71	93.0	B-59	7/17/73	53.6	BH-14	10/11/79	53.7
B-54	4/04/72	90.9	B-59	11/13/73	55.8	BH-14	6/16/80	55.3
B-54	8/10/72	90.3	B-59	6/07/74	60.5	BH-14	6/22/81	55.3
B-54	12/01/72	87.0	B-59	6/13/74	53.0	BH-14	6/24/82	54.4
B-54	4/05/73	85.5	B-59	6/13/75	54.4	BH-14	6/08/83	52.7
B-54	6/29/73	85.5	B-59	8/03/76	56.5	BH-14	7/15/86	43.3
B-54	11/13/73	88.7	B-59	6/10/77	58.0	BH-14	6/01/87	48.1
B-54	6/06/74	85.1	B-59	6/13/78	55.8	BH-15	3/03/78	16.4
B-54	6/11/75	87.5	B-59	6/06/79	53.6	BH-15	6/06/79	23.9
B-54	8/03/76	92.1	B-59	6/18/80	56.0	BH-15	10/11/79	26.0
B-54	6/09/77	92.0	B-59	6/23/81	54.4	BH-15	6/16/80	29.5
B-54	6/12/78	88.9	B-59	6/24/82	55.1	BH-15	6/22/81	34.0
B-54	6/07/79	86.5	B-59	6/08/83	53.7	BH-15	7/02/81	34.5
B-54	6/17/80	87.8	B-59	6/19/84	54.9	BH-15	6/24/82	37.0
B-54	6/22/81	86.2	B-59	6/05/85	55.8	BH-15	6/08/83	38.9
B-54	6/24/82	87.8	B-59	7/15/86	58.3	BH-15	6/19/84	40.9
B-54	6/09/83	86.4	B-59	6/01/87	57.1	BH-15	6/05/85	42.9
B-54	6/19/84	87.4	B-59	4/20/92	57.8	BH-15	7/15/86	44.6
B-54	6/05/85	88.9	B-69	6/12/78	31.5	BH-15	6/01/87	45.9
B-54	7/15/86	89.8	B-69	6/06/79	29.3	F-12	7/21/69	48.9
B-54	6/01/87	89.8	B-69	6/16/80	38.3	F-12	6/05/74	50.5

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-12	6/27/75	52.1	F-15	6/01/87	53.8	F-19	4/20/92	58.0
F-12	8/02/76	53.7	F-16B	6/18/69	47.0	F-20	9/09/69	52.3
F-12	6/09/77	55.5	F-16B	12/01/72	47.9	F-20	6/06/74	55.5
F-12	6/08/78	53.8	F-16B	6/05/74	47.8	F-20	6/10/75	59.8
F-12	6/06/79	52.0	F-16B	6/13/75	49.5	F-20	6/13/75	59.8
F-12	6/16/80	55.3	F-16B	8/02/76	52.0	F-20	8/03/76	60.2
F-12	4/20/92	59.2	F-16B	6/09/77	53.6	F-20	6/10/77	61.0
F-15	6/03/69	44.8	F-16B	6/08/78	51.8	F-20	6/08/78	59.3
F-15	6/18/69	44.5	F-17A	5/06/69	45.5	F-20	6/06/79	57.7
F-15	9/09/69	48.9	F-17A	6/18/69	48.7	F-20	6/17/80	59.0
F-15	5/28/70	43.8	F-17A	6/06/74	47.8	F-20	6/22/81	56.8
F-15	12/07/70	46.7	F-17A	6/13/75	49.8	F-20	6/24/82	58.1
F-15	3/30/71	46.2	F-17A	8/03/76	52.0	F-20	6/08/83	58.0
F-15	3/31/71	46.5	F-17A	6/10/77	53.8	F-20	6/05/85	59.0
F-15	4/26/71	46.3	F-17A	6/08/78	52.0	F-20	7/15/86	59.6
F-15	8/03/71	47.5	F-17A	6/06/79	50.2	F-20	6/01/87	60.7
F-15	12/22/71	49.5	F-17A	6/16/80	52.4	F-20	4/20/92	61.3
F-15	4/04/72	49.0	F-17A	6/22/81	51.5	F-21	12/12/69	50.0
F-15	8/10/72	48.7	F-17A	6/24/82	53.1	F-21	5/28/70	50.3
F-15	12/01/72	45.5	F-17A	7/16/86	55.9	F-21	8/03/71	54.1
F-15	6/29/73	44.2	F-17A	6/01/87	55.9	F-21	6/05/74	76.6
F-15	6/05/74	47.4	F-17A	4/20/92	56.8	F-21	8/02/76	56.5
F-15	6/10/75	46.7	F-19	6/06/74	52.8	F-21	6/09/77	63.8
F-15	8/02/76	48.8	F-19	6/10/75	56.3	F-21	6/08/78	59.0
F-15	6/09/77	50.6	F-19	6/13/75	56.3	F-23A	6/18/69	72.8
F-15	6/08/78	48.8	F-19	8/03/76	57.0	F-23A	9/10/69	73.2
F-15	6/06/79	47.1	F-19	5/10/77	57.9	F-23A	5/23/70	73.6
F-15	6/16/80	49.4	F-19	6/10/77	58.4	F-23A	12/07/70	73.9
F-15	6/22/81	48.4	F-19	6/08/78	56.6	F-23A	3/31/71	75.9
F-15	6/23/82	50.1	F-19	6/06/79	54.8	F-23A	4/26/71	78.1
F-15	6/08/83	53.0	F-19	6/16/80	56.6	F-23A	8/03/71	77.7
F-15	6/19/84	52.1	F-19	6/23/81	55.6	F-23A	12/22/71	81.5
F-15	6/05/85	52.8	F-19	6/24/82	55.2	F-23A	4/04/72	80.3
F-15	7/15/86	53.0	F-19	7/15/86	57.6	F-23A	8/10/72	79.6

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-23A	12/01/72	75.3	F-24A	7/15/86	65.5	F-30	6/08/83	62.2
F-23A	6/29/73	74.1	F-24A	6/01/87	66.6	F-30	6/19/84	63.1
F-23A	11/13/73	77.1	F-24A	4/20/92	66.3	F-30	6/05/85	69.3
F-23A	6/06/74	74.7	F-24B	6/06/74	63.4	F-30	7/15/86	65.9
F-23A	6/10/75	77.3	F-24B	6/10/75	65.9	F-30	6/01/87	66.2
F-23A	8/02/76	79.3	F-24B	8/02/76	68.1	F-30	4/20/92	66.3
F-23A	6/09/77	80.4	F-24B	6/09/77	69.0	F-31A	6/06/74	103.3
F-23A	6/08/78	79.0	F-24B	6/08/78	67.6	F-31A	6/10/75	105.7
F-23A	6/06/79	76.3	F-24B	6/06/79	65.0	F-31A	8/02/76	107.8
F-23A	6/17/80	79.0	F-24B	6/16/80	67.7	F-31A	6/09/77	109.1
F-23A	6/22/81	76.3	F-24B	6/22/81	65.0	F-31A	6/09/78	107.3
F-23A	6/23/82	77.3	F-24B	6/23/82	66.1	F-31A	6/07/79	104.9
F-23A	6/08/83	75.8	F-24B	6/08/83	64.6	F-31A	6/17/80	107.0
F-23A	6/19/84	77.4	F-24B	6/19/84	66.1	F-31A	6/22/81	104.7
F-23A	6/05/85	78.5	F-24B	6/05/85	66.1	F-31A	6/23/82	105.8
F-23A	7/15/86	79.6	F-24B	7/15/86	69.2	F-31A	6/08/83	104.3
F-23A	6/01/87	80.4	F-24B	6/01/87	69.2	F-31A	6/19/84	105.6
F-23A	4/20/92	80.1	F-24B	4/20/92	70.7	F-31A	6/05/85	106.8
F-24A	12/01/72	63.6	F-3	6/13/78	54.4	F-31A	7/15/86	107.7
F-24A	4/05/73	60.3	F-3	6/06/79	53.4	F-31A	6/01/87	108.2
F-24A	6/29/73	60.2	F-3	6/17/80	55.7	F-31A	4/20/92	108.0
F-24A	11/13/73	63.3	F-3	6/22/81	54.7	F-38	6/24/82	79.3
F-24A	6/06/74	60.9	F-3	6/23/82	56.5	F-38	6/09/83	77.5
F-24A	6/10/75	63.3	F-3	6/08/83	54.8	F-38	6/19/84	78.5
F-24A	8/02/76	65.4	F-3	6/19/84	56.0	F-38	6/05/85	82.1
F-24A	6/09/77	67.4	F-3	6/05/85	58.1	F-38	7/15/86	82.5
F-24A	6/08/78	65.2	F-3	7/15/86	60.9	F-38	6/01/87	82.0
F-24A	6/06/79	62.4	F-3	6/01/87	61.1	F-39A	6/06/74	61.5
F-24A	6/16/80	65.2	F-3	4/20/92	60.4	F-39A	6/10/75	64.2
F-24A	6/23/81	62.5	F-30	6/13/78	58.7	F-39A	8/02/76	66.5
F-24A	6/23/82	64.5	F-30	6/07/79	55.5	F-39A	6/09/77	68.4
F-24A	6/08/83	62.0	F-30	6/17/80	63.1	F-39A	6/09/78	65.7
F-24A	6/19/84	63.5	F-30	6/22/81	60.1	F-39A	6/13/79	63.2
F-24A	6/05/85	64.5	F-30	6/23/82	63.5	F-39A	6/17/80	65.0

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-39A	6/22/81	62.5	F-49	6/12/75	43.0	F-57	8/02/76	54.7
F-39A	6/24/82	64.6	F-49	6/09/78	38.7	F-57	6/09/77	56.5
F-39A	6/09/83	62.7	F-49	6/13/79	42.1	F-57	6/08/78	54.5
F-39A	6/19/84	63.7	F-49	6/17/80	43.5	F-57	6/06/79	49.7
F-39A	6/05/85	65.6	F-49	6/23/81	41.2	F-57	6/16/80	55.0
F-39A	7/15/86	66.8	F-5	8/20/58	46.4	F-57	6/22/81	53.8
F-39A	6/01/87	66.5	F-5	6/22/60	45.1	F-57	6/23/82	55.7
F-39A	4/20/92	67.6	F-5	9/09/69	57.7	F-57	6/08/83	52.6
F-39C	6/19/84	6.2	F-5	6/07/74	58.0	F-57	6/19/84	55.2
F-39C	6/05/85	6.7	F-5	6/10/75	58.8	F-57	6/05/85	57.0
F-39C	7/15/86	3.8	F-5	8/02/76	61.7	F-57	7/15/86	60.4
F-39C	6/01/87	5.3	F-5	6/09/77	63.5	F-57	6/01/87	58.6
F-39C	4/20/92	1.6	F-5	6/08/78	61.5	F-57	4/20/92	59.3
F-45A	6/17/69	50.4	F-5	6/06/79	59.7	F-58	6/06/79	50.3
F-45A	9/10/69	55.6	F-5	6/16/80	61.8	F-58	6/16/80	52.7
F-45A	4/15/70	55.9	F-5	6/22/81	60.8	F-58	6/22/81	51.7
F-45A	6/06/74	55.5	F-5	6/23/82	62.5	F-59	6/03/69	55.6
F-45A	6/12/75	57.7	F-5	6/08/83	60.6	F-59	6/16/69	53.0
F-45A	8/03/76	59.4	F-5	6/19/84	62.2	F-59	9/09/69	53.0
F-45A	6/10/77	61.3	F-5	6/05/85	64.0	F-59	5/28/70	51.8
F-45A	6/08/78	59.4	F-5	7/15/86	65.7	F-59	12/07/70	55.7
F-45A	6/06/79	56.9	F-5	6/01/87	65.7	F-59	3/30/71	58.8
F-45A	6/16/80	59.4	F-5	4/20/92	66.4	F-59	3/31/71	54.7
F-45A	6/22/81	57.1	F-50B	6/13/79	59.2	F-59	4/26/71	55.0
F-45A	6/24/82	57.9	F-50B	6/17/80	61.8	F-59	8/03/71	56.5
F-45A	6/08/83	56.8	F-50B	6/22/81	63.6	F-59	12/22/71	58.6
F-45A	6/19/84	57.8	F-55B	6/06/79	59.9	F-59	6/06/74	55.7
F-45A	6/05/85	58.7	F-55B	6/18/80	62.4	F-59	6/10/75	58.5
F-45A	7/15/86	60.3	F-55B	6/22/81	60.4	F-59	8/03/76	61.5
F-45A	6/01/87	60.5	F-55B	6/24/82	61.3	F-59	6/09/77	63.4
F-45A	4/20/92	61.0	F-56	6/06/79	50.6	F-59	6/13/78	58.5
F-49	6/16/69	38.4	F-56	6/16/80	50.7	F-59	6/06/79	55.4
F-49	5/18/70	40.1	F-57	6/06/74	50.4	F-59	6/16/80	57.9
F-49	7/29/74	43.0	F-57	6/12/75	52.3	F-59	6/22/81	55.4

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-59	6/24/82	56.3	F-62	6/10/77	68.5	F-65	4/26/71	76.8
F-59	6/08/83	56.6	F-62	6/08/78	50.5	F-65	8/03/71	71.8
F-59	6/19/84	57.9	F-62	6/14/79	52.0	F-65	8/06/71	73.9
F-59	6/05/85	59.7	F-62	6/17/80	57.0	F-65	12/22/71	73.8
F-59	7/15/86	61.5	F-62	6/23/81	64.0	F-65	4/04/72	73.3
F-59	6/01/87	60.7	F-62	6/30/82	56.0	F-65	8/10/72	72.3
F-59	4/20/92	62.3	F-62	6/10/83	57.0	F-65	4/05/73	69.3
F-61B	6/03/69	37.0	F-62	6/21/84	67.0	F-65	6/29/73	69.1
F-61B	6/16/69	36.3	F-62	6/11/85	61.0	F-65	11/13/73	71.3
F-61B	9/09/69	38.6	F-62	7/16/86	58.0	F-65	6/06/74	66.2
F-61B	12/07/70	37.5	F-62	6/01/87	54.0	F-65	6/10/75	69.3
F-61B	12/01/72	36.3	F-62	4/20/92	58.0	F-65	8/02/76	71.8
F-61B	4/05/73	35.2	F-64	6/16/69	40.2	F-65	6/09/77	74.4
F-61B	6/29/73	36.8	F-64	7/23/69	39.0	F-65	6/09/78	74.7
F-61B	11/13/73	40.0	F-64	9/09/69	41.8	F-65	6/07/79	72.3
F-61B	6/06/74	36.7	F-64	6/06/74	39.7	F-65	6/17/80	74.7
F-61B	6/10/75	38.8	F-64	6/11/75	41.6	F-65	6/09/83	69.4
F-61B	8/03/76	42.3	F-64	6/09/77	48.3	F-65	6/19/84	71.3
F-61B	6/09/77	43.9	F-64	6/08/78	43.7	F-65	6/05/85	75.0
F-61B	6/08/78	40.7	F-64	6/13/79	42.8	F-65	7/15/86	73.8
F-61B	6/06/79	38.9	F-64	6/16/80	43.8	F-65	6/01/87	74.7
F-61B	6/16/80	39.9	F-64	6/22/81	43.0	F-65	4/20/92	74.5
F-61B	6/22/81	38.6	F-64	6/24/82	46.3	F-66	6/07/79	33.0
F-61B	6/24/82	41.3	F-64	6/08/83	44.6	F-66	6/16/80	34.0
F-61B	6/08/83	40.4	F-64	6/19/84	46.1	F-66	6/22/81	31.2
F-61B	6/19/84	41.0	F-64	6/05/85	48.8	F-66	6/24/82	35.6
F-61B	6/05/85	43.4	F-64	7/15/86	50.3	F-66	6/09/83	34.4
F-61B	7/15/86	44.8	F-64	6/01/87	49.3	F-68B	12/01/72	38.9
F-61B	6/01/87	43.4	F-64	4/20/92	49.0	F-68B	4/05/73	37.6
F-61B	4/20/92	42.9	F-65	5/19/69	65.6	F-68B	6/29/73	38.7
F-62	6/16/69	46.5	F-65	5/28/69	66.1	F-68B	11/13/73	43.8
F-62	6/02/70	41.5	F-65	5/28/70	66.1	F-68B	6/07/74	37.9
F-62	6/13/74	55.5	F-65	3/30/71	74.9	F-68B	6/11/75	40.9
F-62	8/04/76	54.5	F-65	3/31/71	75.1	F-68B	8/03/76	45.0

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-68B	6/09/77	48.1	F-72	6/07/79	37.5	F-75B	6/22/81	25.2
F-68B	6/09/78	43.5	F-72	6/16/80	38.5	F-75B	6/24/82	30.1
F-68B	6/07/79	40.1	F-72	6/22/81	36.9	F-75B	6/09/83	27.4
F-68B	6/16/80	41.1	F-72	6/24/82	39.3	F-75B	6/19/84	28.5
F-68B	6/22/81	38.4	F-72	6/09/83	38.5	F-75B	6/05/85	31.9
F-68B	6/24/82	42.5	F-72	6/19/84	38.7	F-75B	7/15/86	32.5
F-68B	6/09/83	40.3	F-72	6/05/85	42.2	F-75B	6/01/87	31.4
F-68B	6/19/84	41.9	F-72	7/15/86	44.1	F-75B	4/20/92	34.9
F-68B	6/05/85	44.6	F-72	6/01/87	42.2	F-76A	8/03/71	33.0
F-68B	7/15/86	45.0	F-72	4/20/92	42.7	F-76A	12/22/71	34.4
F-68B	6/01/87	44.1	F-73	6/07/74	45.3	F-76A	4/04/72	33.8
F-68B	4/20/92	47.3	F-73	6/11/75	47.0	F-76A	8/10/72	31.9
F-69	6/07/74	54.8	F-73	8/02/76	50.1	F-76A	7/15/86	32.7
F-69	6/11/75	48.0	F-73	6/09/77	52.0	F-76A	6/01/87	31.5
F-69	7/01/75	50.2	F-73	6/09/78	49.6	F-76A	4/20/92	35.2
F-69	8/02/76	50.2	F-73	6/07/79	47.5	F-78	6/10/75	52.2
F-69	6/09/77	53.0	F-73	6/16/80	47.8	F-78	8/03/76	54.3
F-69	6/09/78	49.3	F-73	6/22/81	47.6	F-78	6/09/77	56.9
F-69	7/17/78	51.3	F-73	6/23/82	49.0	F-78	6/09/78	54.0
F-69	6/07/79	46.1	F-73	6/09/83	48.5	F-78	6/13/79	52.9
F-69	6/16/80	47.7	F-73	6/19/84	50.2	F-78	6/17/80	53.8
F-69	6/09/83	46.8	F-73	6/05/85	52.8	F-78	6/23/81	51.6
F-69	6/19/84	47.9	F-73	7/15/86	51.5	F-78	6/24/82	53.0
F-69	6/05/85	50.6	F-73	6/01/87	52.3	F-78	6/10/83	51.4
F-69	7/15/86	51.6	F-73	4/20/92	53.3	F-78	6/19/84	53.4
F-69	6/01/87	50.2	F-75B	5/28/69	25.6	F-78	6/05/85	53.6
F-69	4/20/92	52.0	F-75B	5/28/70	25.6	F-78	7/15/86	54.6
F-72	6/17/69	36.7	F-75B	6/07/74	25.1	F-78	6/01/87	54.9
F-72	6/07/74	35.9	F-75B	6/11/75	28.7	F-78	4/20/92	55.7
F-72	6/11/75	38.6	F-75B	8/03/76	32.0	F-7B	9/09/69	56.1
F-72	8/02/76	41.1	F-75B	6/09/77	35.6	F-7B	5/25/70	54.4
F-72	6/09/77	43.7	F-75B	6/09/78	30.8	F-7B	8/05/71	60.0
F-72	6/09/78	39.9	F-75B	6/07/79	27.1	F-7B	8/10/72	58.6
F-72	7/17/78	42.3	F-75B	6/16/80	28.3	F-7B	6/29/73	55.6

Table 7 - Water Levels
Well Name, Date Measured, Depth to water [ft]

F-7B	6/07/74	55.8	FNAL-1	8/11/76	57.4	FNAL-3	6/09/70	57.5
F-7B	6/10/75	58.0	FNAL-1	6/10/77	65.4	FNAL-3	6/12/75	67.0
F-7B	8/02/76	60.3	FNAL-1	6/08/78	63.4	FNAL-3	6/27/75	67.0
F-7B	6/09/77	62.2	FNAL-1	6/14/79	55.9	FNAL-3	1/30/76	70.0
F-7B	6/08/78	59.8	FNAL-1	6/17/80	57.0	FNAL-3	8/04/76	69.0
F-7B	6/06/79	53.5	FNAL-1	6/23/81	54.0	FNAL-3	6/10/77	75.7
F-7B	6/16/80	60.9	FNAL-1	6/30/82	51.0	FNAL-3	6/08/78	79.0
F-7B	6/22/81	59.9	FNAL-1	6/10/83	49.0	FNAL-3	6/14/79	66.6
F-7B	6/23/82	61.6	FNAL-1	6/21/84	51.0	FNAL-3	7/03/80	68.1
F-7B	6/08/83	59.6	FNAL-1	6/11/85	55.0	FNAL-3	6/23/81	66.4
F-7B	6/19/84	61.0	FNAL-1	7/16/86	58.1	FNAL-3	6/30/82	80.0
F-7B	6/05/85	63.0	FNAL-1	6/03/87	61.4	FNAL-3	6/10/83	78.0
F-7B	7/15/85	64.8	FNAL-1	4/20/92	55.7	FNAL-3	6/21/84	78.0
F-7B	7/15/86	64.8	FNAL-2	5/18/70	53.7	FNAL-3	6/11/85	80.0
F-7B	6/01/87	64.4	FNAL-2	9/01/70	58.7	FNAL-3	7/16/86	81.0
F-7B	4/20/92	65.5	FNAL-2	8/03/71	57.7	FNAL-3	6/01/87	76.0
F-8	6/07/74	59.2	FNAL-2	8/10/72	57.8	FNAL-3	4/20/92	80.0
F-8	6/13/75	61.3	FNAL-2	6/29/73	52.4	S-35	11/15/68	54.3
F-8	8/03/76	63.7	FNAL-2	6/06/74	53.2	S-35	12/14/68	51.0
F-8	6/09/77	65.4	FNAL-2	6/12/75	54.9	S-35	1/10/69	53.0
F-8	6/08/78	63.6	FNAL-2	6/23/76	55.9	S-35	6/03/69	50.5
F-8	6/06/79	61.9	FNAL-2	8/03/76	57.1	S-35	6/17/69	50.4
F-8	6/16/80	64.3	FNAL-2	6/10/77	58.6	S-35	9/10/69	50.2
F-8	6/22/81	63.3	FNAL-2	6/28/78	57.3	S-35	5/28/70	49.2
F-8	6/23/82	64.9	FNAL-2	6/06/79	54.3	S-35	12/07/70	44.7
F-8	6/08/83	62.8	FNAL-2	6/16/80	56.8	S-35	3/30/71	51.5
F-8	6/19/84	64.3	FNAL-2	6/23/81	54.8	S-35	3/31/71	47.3
F-8	6/05/85	66.2	FNAL-2	6/23/82	55.5	S-35	4/26/71	51.3
F-8	7/15/86	67.9	FNAL-2	6/10/83	54.1	S-35	8/03/71	50.4
F-8	6/01/87	68.2	FNAL-2	6/21/84	55.2	S-35	12/22/71	56.2
F-8	4/20/92	68.8	FNAL-2	6/11/85	56.3	S-35	8/10/72	55.9
FNAL-1	12/18/69	51.0	FNAL-2	7/15/86	57.6	S-35	12/01/72	52.3
FNAL-1	6/12/75	62.4	FNAL-2	6/01/87	59.9	S-35	4/05/73	51.2
FNAL-1	8/04/76	57.4	FNAL-2	4/20/92	58.4	S-35	6/29/73	50.6

S-35	11/13/73	53.6
S-35	6/06/74	51.5
S-35	6/12/75	53.1
S-35	8/03/76	55.2
S-35	6/10/77	56.7
S-35	6/08/78	55.3
S-35	6/06/79	52.7
S-35	6/16/80	53.9
S-35	6/22/81	53.3
S-35	6/24/82	54.0
S-35	6/08/83	53.5
S-35	6/19/84	53.4
S-35	6/05/85	54.7
S-35	7/15/86	56.2
S-35	6/01/87	56.0
S-35	4/20/92	57.5

Table 8
Wells with Chart Recorders--39c, 39d, FNAL-2
Water Levels for 39c

TM 1850

Taped levels from FNAL SHALLOW (well 39c). The water levels are from 39c sheets, which had water level recorder data included. These are measurements made with a tape from the reference point down to the water level. The reference point absolute elevation is 759.44'.

4/30/84	1.6
5/30/84	2.42
6/27/84	6.69
7/30/84	9.87
8/29/84	9.95
9/27/84	7.19
10/26/84	9.58
11/29/84	5.4
12/28/84	3.01
1/29/85	5.78
1/29/85	5.78
2/27/85	2.1
3/28/85	0.37
4/29/85	2.95
5/30/85	6.79
6/27/85	5.92
7/26/85	5.99
8/28/85	9.01
9/26/85	9.0
10/28/85	6.45
11/25/85	1.94
12/30/85	0.12
1/30/86	6.74
2/27/86	6.88
3/28/86	3.27
4/29/86	6.82
5/30/86	6.22
7/1/86	3.83
7/29/86	7.33
8/28/86	8.83
9/26/86	3.24
10/29/86	4.47
11/26/86	5.47
12/30/86	6.91
1/27/87	8.47
2/27/87	7.17
3/30/87	6.98
4/29/87	3.68
5/29/87	6.39
6/25/87	8.43
7/31/87	5.0
8/27/87	1.42
9/28/87	4.42
10/26/87	8.67
11/23/87	8.59
12/30/87	1.44
1/28/88	3.14

Table 9
Wells with Chart Recorders--39c, 39d, FNAL-2
Maximum Water Levels for 39c

TM 1850

Maximum levels from FNAL SHALLOW (well 39c). Given below is the value for the highest value of the water level on the chart recorder in a given period, which is that period since the water level was last inspected and a tape reading was taken.

10/18/85	0.36
11/19/85	0.11
12/1/85	0.14
1/1/86	4.3
2/3/86	6.61
3/18/86	2.42
4/1/86	3.64
5/16/86	2.9
6/30/86	2.05
8/25/86	6.64
9/29/86	0.41
10/2/86	0.32
11/1/86	4.77
12/8/86	3.09
1/6/87	6.14
2/7/87	2.18
3/1/87	4.3
4/14/87	1.46
5/21/87	2.35
6/10/87	1.14
7/15/87	4.52
9/16/87	0.54
10/1/87	7.49
11/28/87	0.95
12/24/87	0.26

Table 10
Wells with Chart Recorders--39c,39d,FNAL-2
Minimum Water Levels, Well 39c

TM 1850

Minimum levels from FNAL SHALLOW (well 39c). Given below is the value of the lowest water level on the chart recorder, in the period since the last reading via tape.

10/3/85	9.08
11/1/85	6.0
12/31/85	4.3
1/31/86	6.91
2/17/86	7.42
3/1/86	6.96
4/28/86	7.3
5/6/86	6.45
6/27/86	8.26
8/31/86	8.86
9/10/86	9.0
10/22/86	6.49
12/31/86	7.13
1/31/87	8.67
2/1/87	8.6
3/31/87	6.95
4/10/87	7.79
5/16/87	6.95
6/30/87	8.81
7/15/87	16.56
9/16/87	5.44
10/31/87	8.71
11/24/87	8.69
12/6/87	3.45

Table 11
Wells with Chart Recorders--39c,39d,FNAL-2
Taped levels for Well 39d

TM 1850

These are levels from 39d sheets. These are measurements with a tape from the reference point down to the water level. The reference point absolute elevation is probably the same as for 39c--which was 759.44'.

11/30/88	8.37
12/30/88	8.92
1/29/89	7.48
2/28/89	7.68
3/31/89	4.48
4/30/89	7.53
5/31/89	7.73
6/30/89	7.98
7/30/89	8.16
8/30/89	8.02
9/29/89	7.56
10/30/89	8.0
11/29/89	8.22
12/30/89	8.72
1/29/90	4.77
2/28/90	3.27
3/31/90	2.79
4/30/90	3.62
5/31/90	3.0
6/30/90	4.37
7/30/90	6.64
8/30/90	6.9
9/29/90	7.73
10/30/90	5.19
11/29/90	2.22
12/30/90	2.25
1/29/91	7.4
2/28/91	7.09
3/31/91	2.68
4/30/91	3.79
5/31/91	2.33
6/30/91	7.36
7/31/91	7.91
8/30/91	8.91
9/29/91	9.85
10/30/91	4.56
11/29/91	2.29
12/30/91	2.8

Table 12

Wells with Chart Recorders--39c,39d,FNAL-2

Levels for FNAL-2(W-2)

TM 1850

These are levels from FNAL-2 sheets, which had water level recorder data included. These are measurements made with a tape from the reference point down to the water level. The reference point absolute elevation is 743.81' [as determined by the Fermilab survey group].

2/22/72	57.18
2/27/72	57.18
4/27/72	57.65
5/26/72	57.46
6/26/72	57.7
7/27/72	57.87
9/1/72	57.12
9/20/72	56.84
2/20/73	53.92
3/23/73	53.77
4/23/73	52.67
5/24/73	52.14
6/25/73	52.38
7/26/73	53.18
8/22/73	54.47
9/26/73	55.14
10/24/73	55.56
11/20/73	55.75
12/17/73	56.16
1/24/74	55.65
2/22/74	53.94
3/18/74	54.14
4/24/74	54.44
5/20/74	53.93
6/24/74	53.58
7/22/74	53.45
8/23/74	54.48
9/27/74	54.65
10/28/74	55.13
11/26/74	55.91
12/24/74	55.88
1/27/75	55.95
2/25/75	55.17
3/24/75	55.18
4/28/75	55.36
5/26/75	55.07
6/27/75	55.3
7/21/75	55.37
8/25/75	55.92
9/26/75	56.82
10/27/75	56.91
12/1/75	57.45
12/24/75	57.36
1/26/76	56.95
2/23/76	57.01
3/23/76	56.47
4/26/76	56.06
5/28/76	55.33
6/23/76	55.88
7/26/76	56.73
8/25/76	57.21
9/27/76	56.89
10/26/76	57.46
11/19/76	57.1
12/21/76	57.63
1/20/77	57.58
2/21/77	57.78
4/27/77	57.98
5/25/77	58.38
6/27/77	58.31
7/22/77	59.02
8/25/77	59.05
9/26/77	58.67
10/24/77	58.94
11/28/77	59.17
12/27/77	59.05
1/24/78	58.54
2/21/78	58.68
3/29/78	58.92
4/25/78	58.24
5/29/78	57.02
6/28/78	57.25
7/28/78	56.83
12/31/79	57.03
1/29/80	57.44
2/27/80	57.07
3/31/80	56.87
4/30/80	56.63
5/29/80	56.58
6/30/80	56.52
7/30/80	56.73
8/29/80	57.27
9/29/80	56.72
10/30/80	56.42
11/26/80	56.3
12/31/80	55.35
1/28/81	55.5

Table 12

Wells with Chart Recorders--39c,39d,FNAL-2

Levels for FNAL-2(W-2)

TM 1850

2/27/81	55.94	6/30/83	54.26	11/26/85	57.59
3/30/81	55.15	7/28/83	54.5	12/30/85	56.81
4/29/81	55.44	8/29/83	55.17	5/30/86	57.17
5/26/81	55.08	9/29/83	55.96	7/1/86	57.4
6/26/81	54.93	10/31/83	56.24	7/29/86	57.65
7/30/81	54.95	11/29/83	55.94	8/28/86	58.18
8/28/81	55	12/28/83	56.08	9/26/86	57.98
9/29/81	55.3	1/27/84	56.27	10/29/86	58.14
10/29/81	55.53	2/24/84	56.03	11/26/86	57.81
11/27/81	55.53	3/28/84	55.49	12/30/86	57.9
12/30/81	55.84	4/30/84	55.34	3/30/87	57.83
1/28/82	55.51	5/30/84	55.51	4/29/87	57.59
2/25/82	56.52	6/29/84	55.42	5/29/87	57.96
3/30/82	55.58	7/30/84	55.97	6/25/87	57.85
4/28/82	55.8	8/29/84	56.03	1/27/87	57.74
5/27/82	54.9	9/27/84	56.83	2/27/87	58.1
6/29/82	55.25	10/30/84	56.78	3/30/87	57.83
7/28/82	55.76	11/29/84	56.57	4/29/87	57.59
8/31/82	55.77	12/28/84	56.76	5/29/87	57.96
9/29/82	55.96	1/29/85	56.94	6/25/87	57.85
10/27/82	56.42	3/28/85	55.79	7/31/87	58.28
11/30/82	56.11	4/29/85	56.14	8/27/87	58.65
12/30/82	56.13	5/30/85	55.85	9/28/87	58.05
1/31/83	55.46	6/27/85	56.64	10/26/87	58.41
2/28/83	55.2	7/26/85	56.97	11/23/87	57.88
3/30/83	55.11	8/28/85	57.6	12/30/87	57.92
4/28/83	54.39	9/26/85	57.25		
5/27/83	54.28	10/28/85	57.85		

The following values are at variance with other water level data for well FNAL-2. This data comes from the set of data associated with the automatic water level recorder on well FNAL 2. The other set of data comes from records on wells kept by Bob Sasman (Illinois State Water Survey, retired), which generally

has yearly measurements of water levels.

7/1/70	82
8/1/70	71
9/1/70	72
11/1/70	71
12/1/70	73
1/1/71	70
2/1/71	72
3/1/71	70
4/1/71	70
5/1/71	70
6/1/71	71
7/1/71	72
8/1/71	70
9/1/71	74
10/1/71	72
11/1/71	73
12/1/71	60.17

end of data
at variance

1/20/72	57.35
10/25/72	55.75
11/22/72	55.11
12/21/72	54.17
1/30/73	53.84
3/25/77	58.4
8/28/78	56.54
9/26/78	57.03
10/30/78	56.91
11/28/78	56.71
12/29/78	56.6
1/25/79	56.19
2/27/79	56.64
3/28/79	55.84
4/27/79	54.89
5/30/79	54.4
6/19/79	54.67
7/20/79	55.44
8/21/79	55.99
9/20/79	56.17
10/30/79	56.78
11/30/79	56.92
2/27/85	57.2
1/30/86	57.31
2/27/86	56.76
3/28/86	56.94
4/29/86	56.91
1/28/88	57.51
2/26/88	56.34
3/30/88	56.49
4/26/88	56.49
5/26/88	56.3
6/28/88	56.86
7/27/88	57.61
8/29/88	58.15
9/27/88	58.3
10/27/88	58.29
11/30/88	58.45
12/23/88	58.35
1/27/89	58.52
2/24/89	58.73
3/29/89	57.8
4/27/89	58.07
5/24/89	57.96
6/28/89	58.62
7/28/89	58.97
8/29/89	59
9/27/89	59.59
10/27/89	59.45
11/28/89	59.5
12/27/89	59.06

Table 12
Wells with Chart Recorders--39c,39d,FNAL-2
MAX DATA for FNAL-2

This is the value for the highest value of the water level on the chart recorder in a given period, which is that period since the water level was last inspected via tape.

2/29/72	56.1
3/6/72	56
4/12/72	56.95
5/14/72	56.94
6/2/72	57.09
7/14/72	57.43
8/23/72	57.05
9/16/72	56.28
2/2/73	53.27
3/25/73	52.85
4/9/73	52.41
5/27/73	51.6
6/16/73	52.05
7/4/73	52.5
8/1/73	53.53
9/3/73	54.55
10/31/73	55
11/1/73	55.15
12/4/73	55.28
1/26/74	54.64
2/22/74	53.84
3/29/74	53.5
4/3/74	53.4
5/30/74	53.2
6/9/74	53
7/2/74	53.16
8/2/74	53.55
9/1/74	54.43
10/14/74	54.88
11/11/74	54.95
12/15/74	55.19
1/10/75	54.7
2/25/75	55.08
3/24/75	55.04
4/18/75	54.85
5/30/75	54.78
6/15/75	54.58
7/6/75	54.94
8/2/75	55.5
9/1/75	56.06
10/22/75	56.63
11/9/75	56.41
12/19/75	56.87
1/31/76	56.35
2/18/76	56.17
3/30/76	55.69
4/21/76	55.39
5/30/76	55.08
6/11/76	55.28
7/2/76	55.95
8/5/76	56.65
9/30/76	56.85
10/14/76	56.68
11/26/76	56.73
12/27/76	56.78
1/26/77	56.93
2/12/77	57.37
4/27/77	57.92
5/5/77	57.84
6/1/77	57.99
7/1/77	58.25
8/10/77	58.63
9/30/77	58.58
10/8/77	58.46
11/30/77	58.19
12/1/77	58.17
1/25/78	57.69
2/24/78	58.21
3/14/78	58
4/15/78	57.7
5/15/78	56.91
6/15/78	56.71
7/15/78	56.54
12/7/79	56.25
1/11/80	56.36
2/22/80	56.5
3/10/80	56.56
4/14/80	56.37
5/10/80	56.18
6/28/80	56.29
7/5/80	56.35
8/2/80	56.5
9/30/80	56.44
10/17/80	55.1
11/29/80	55.24
12/31/80	55.35
1/25/81	55
2/23/81	54.11
3/30/81	55.03
4/4/81	54.94
5/29/81	54.79
6/22/81	54.41
7/20/81	54.3

Table 12
Wells with Chart Recorders--39c,39d,FNAL-2
MAX DATA for FNAL-2

TM 1850

8/7/81	54.45
9/1/81	54.76
10/17/81	54.65
11/26/81	54.83
12/1/81	54.66
1/3/82	54.6
2/20/82	55.48
3/12/82	55.24
4/3/82	54.64
5/29/82	54.82
6/15/82	54.85
7/11/82	55.21
8/25/82	55.35
9/1/82	55.49
10/9/82	55.63
11/12/82	55.6
12/28/82	55.17
1/10/83	54.99
2/2/83	54.46
3/27/83	54.44
4/14/83	54.12
5/31/83	53.77
6/3/83	53.88
7/3/83	54.14
8/10/83	54.5
9/5/83	54.9
10/3/83	55.36
11/20/83	55.55
2/7/84	56.82
2/23/84	55.91
3/21/84	55.28
4/23/84	55.15
5/25/84	55
6/27/84	54.9
7/5/84	55.12
8/8/84	55.65
9/1/84	56.13
10/15/84	56.16
11/9/84	56.25
12/21/84	56.16
1/18/85	56.7
3/31/85	55.6
4/15/85	55.42
5/12/85	55.5
6/1/85	55.96
7/4/85	56.32
8/5/85	56.84
9/23/85	57.2
10/4/85	56.93
11/1/85	56.95
12/23/85	56.41
5/5/86	56.62
6/11/86	56.91
7/11/86	57.27
8/8/86	57.55
9/11/86	57.45
10/3/86	57.75
11/20/86	57.66
12/2/86	57.68
3/1/87	57.02
4/30/87	57.51
5/12/87	57.59
6/13/87	57.66
3/1/87	57.02
4/30/87	57.51
5/12/87	57.59
6/13/87	57.66
7/2/87	57.94
8/2/87	58.07
9/29/87	57.85
10/1/87	57.45
11/17/87	57.69
12/15/87	56.84
1/19/88	56.43
2/22/88	55.91
4/21/88	55.46
5/9/88	55.46
6/2/88	56.09
7/2/88	56.87
8/5/88	57.73
9/19/88	57.6
10/23/88	57.73
11/5/88	57.62
12/14/88	57.95
1/31/89	57.79
2/26/89	58.1
3/15/89	57.39
4/4/89	57.41
5/5/89	57.76
6/13/89	58.12
7/2/89	58.49
8/4/89	58.59
9/1/89	58.7
10/2/89	58.72
11/27/89	58.7
12/4/89	58.82

Table 12
Wells with Chart Recorders--39c,39d,FNAL-2
MIN DATA for FNAL-2

TM 1850

This is the value of the lowest water level on the chart recorder, in the period since the last reading via tape.

2/10/72	57.96	1/22/75	56.38	9/3/77	59.15
3/30/72	57.77	2/3/75	56.43	10/3/77	59.35
4/8/72	58.16	3/26/75	56.4	11/13/77	59.45
5/11/72	57.88	4/5/75	56.35	12/10/77	59.45
6/14/72	58	5/1/75	55.78	1/10/78	59.23
7/6/72	58.18	6/30/75	55.51	2/3/78	59.14
8/4/72	58	7/31/75	55.73	3/24/78	59.07
9/2/72	57.26	8/27/75	56.43	4/2/78	58.81
2/16/73	54.36	9/24/75	56.88	5/15/78	58.3
3/8/73	53.93	10/30/75	57.5	6/15/78	57.48
4/13/73	53.45	11/30/75	57.45	7/11/78	57.21
5/4/73	52.84	12/6/75	57.76	12/17/79	57.71
6/30/73	52.58	1/4/76	57.41	1/12/80	57.52
7/31/73	53.55	2/14/76	57.4	2/29/80	57.66
8/30/73	54.65	3/6/76	56.91	3/1/80	57.69
9/27/73	55.34	4/12/76	56.5	4/16/80	57.31
10/22/73	55.86	5/8/76	56.01	5/16/80	56.95
11/10/73	56.33	6/30/76	56.05	6/4/80	56.96
12/7/73	56.58	7/31/76	56.78	7/24/80	56.85
1/2/74	56.4	8/30/76	57.44	8/24/80	57.44
2/1/74	55.4	9/24/76	57.55	9/5/80	57.36
3/10/74	55.02	10/27/76	57.74	10/5/80	56.85
4/24/74	54.44	11/13/76	57.68	11/11/80	56.49
5/1/74	54.2	12/13/76	57.84	12/20/80	56.51
6/3/74	53.71	1/22/77	58.16	1/4/81	56.11
7/31/74	53.85	2/7/77	58.45	2/13/81	56.49
8/24/74	54.53	4/8/77	59.03	3/8/81	56.18
9/23/74	55.24	5/12/77	58.51	4/15/81	56.5
10/21/74	55.75	6/15/77	58.71	5/6/81	55.73
11/25/74	55.94	7/26/77	59.05	6/1/81	55.16
12/26/74	56.06	8/30/77	59.14	7/31/81	55.05

Table 12
Wells with Chart Recorders--39c,39d,FNAL-2
MIN DATA for FNAL-2

TM 1850

8/25/81	55.17
9/23/81	55.55
10/23/81	55.63
11/10/81	55.87
12/9/81	55.87
1/28/82	56.01
2/25/82	56.57
3/28/82	56.39
4/7/82	56.1
5/1/82	55.54
6/30/82	55.61
7/24/82	55.91
8/28/82	55.97
9/30/82	56.02
10/24/82	56.64
11/27/82	56.86
12/9/82	56.95
1/3/83	56
2/12/83	55.68
3/29/83	55.38
4/5/83	55.04
5/9/83	54.72
6/22/83	54.57
7/7/83	54.8
8/25/83	55.34
9/24/83	55.97
10/29/83	56.61
11/27/83	56.58
1/14/84	56.9
2/7/84	56.82
3/16/84	56.54
4/1/84	56.08
5/16/84	55.89
6/15/84	55.55
7/29/84	56.1
8/25/84	56.5
9/26/84	57
10/23/84	57.09
11/21/84	57.5
12/26/84	57.46
1/2/85	57.43
3/6/85	57.34
4/15/85	56.51
5/22/85	56.15
6/30/85	56.87
7/17/85	57.11
8/28/85	57.65
9/13/85	58.9
10/16/85	57.85
11/21/85	58.1
12/3/85	57.86
5/3/86	57.44
6/25/86	57.74
7/23/86	57.89
8/28/86	58.22
9/16/86	58.43
10/18/86	58.55
11/13/86	58.73
12/13/86	58.6
3/4/87	58.35
4/25/87	58.5
5/5/87	58.22
6/9/87	58.15
3/4/87	58.35
4/25/87	58.5
5/5/87	58.22
6/9/87	58.15
7/21/87	58.49
8/24/87	59
9/3/87	58.83
10/31/87	58.72
11/10/87	58.72
12/6/87	58.26
1/6/88	58.03
2/4/88	57.39
4/7/88	56.3
5/25/88	56.4
6/26/88	56.91
7/28/88	57.7
8/31/88	58.17
9/26/88	58.44
10/30/88	58.91
11/21/88	58.93
12/4/88	59.1
1/13/89	58.96
2/16/89	59.3
3/8/89	58.85
4/30/89	58.36
5/28/89	58.71
6/29/89	58.85
7/23/89	59.14
8/18/89	59.25
9/27/89	59.59
10/18/89	59.58
11/29/89	59.7
12/22/89	60.06

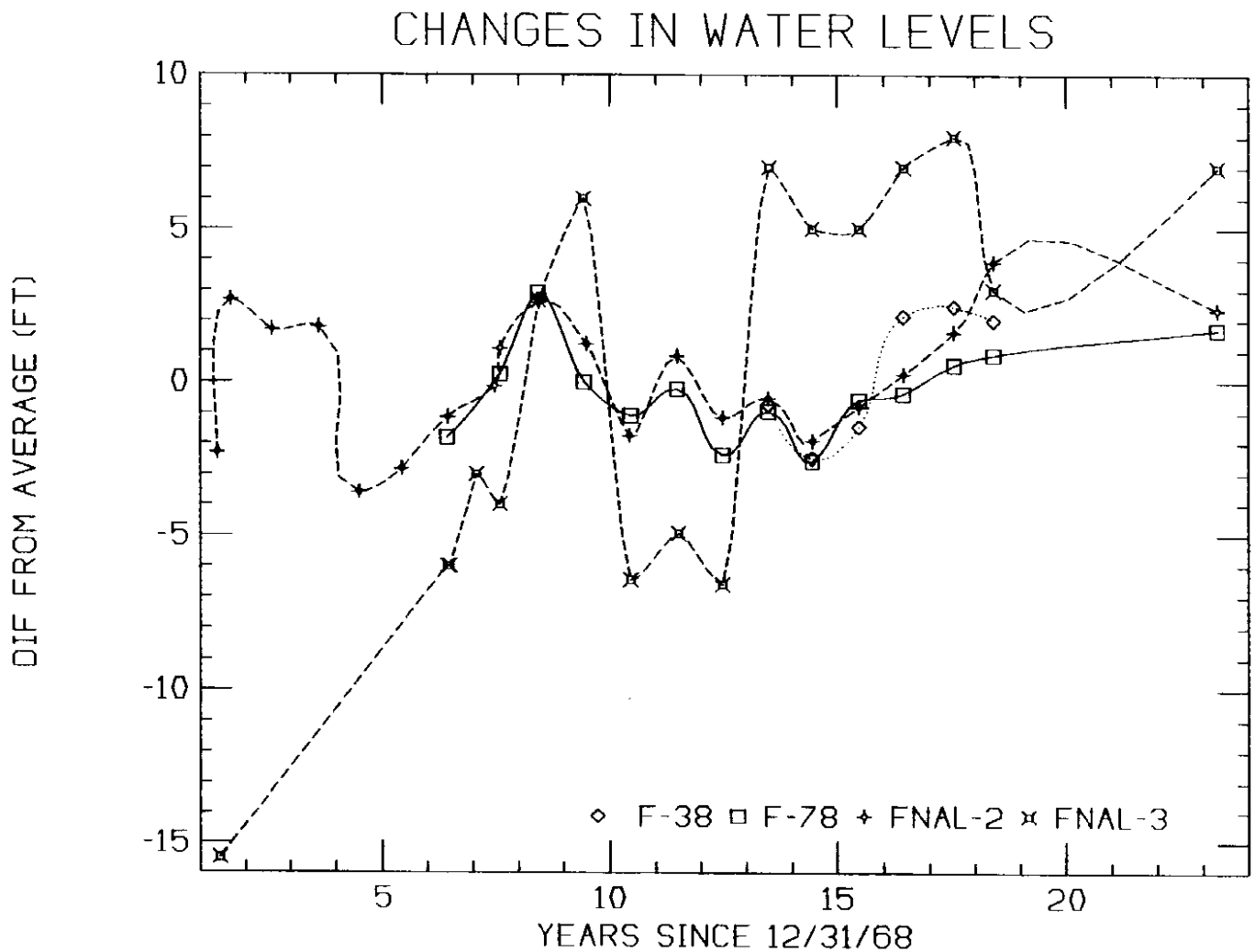
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
10
5
0
-5
-10
-15
5
10
15
20
YEARS SINCE 12/31/68
F-38
F-78
FNAL-2
FNAL-3

Fig. 3

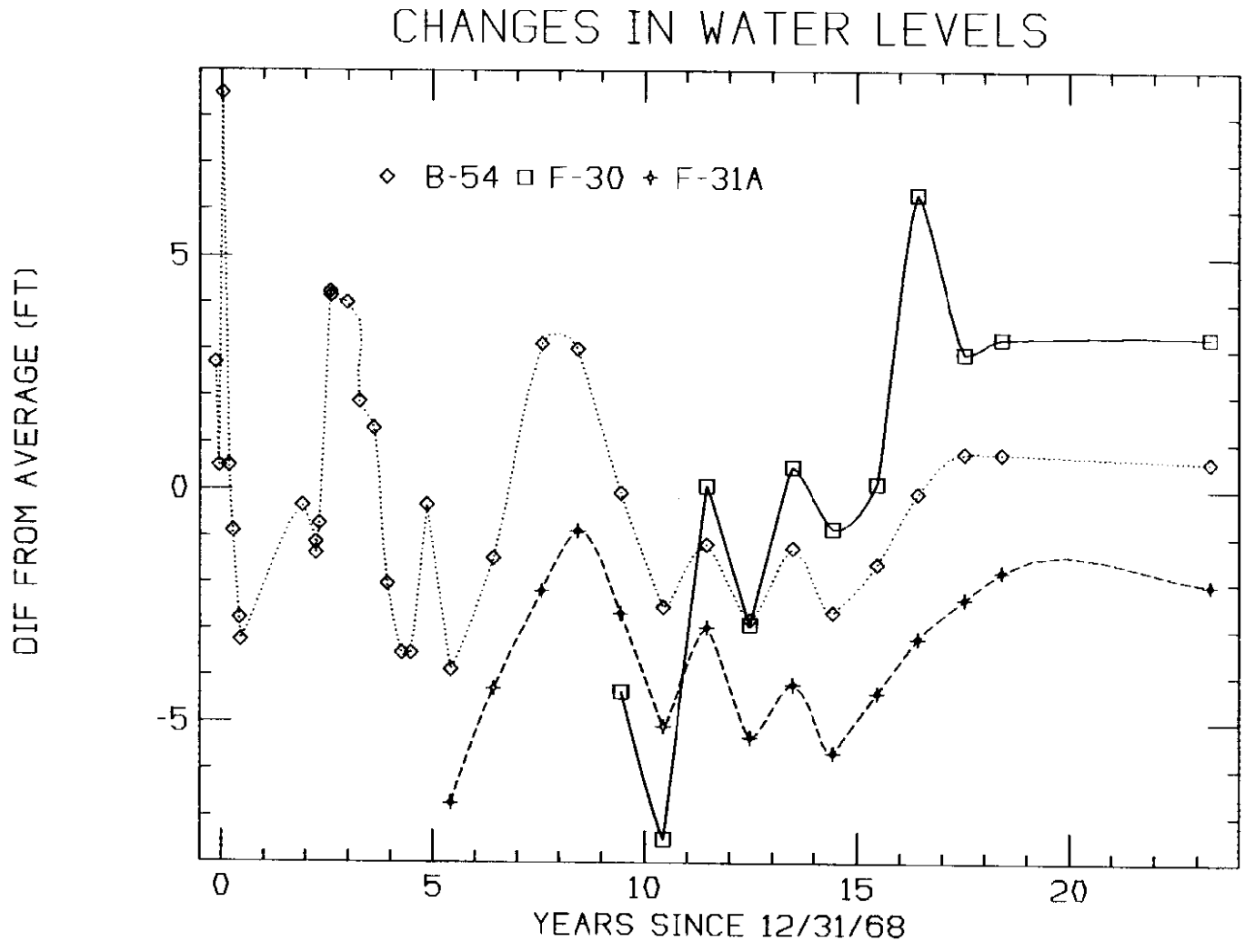
CHANGES IN WATER LEVELS
B-54 F-30 F-31A
DIF FROM AVERAGE (FT)
5
0
-5
0
5
10
15
20
YEARS SINCE 12/31/68

Fig. 4

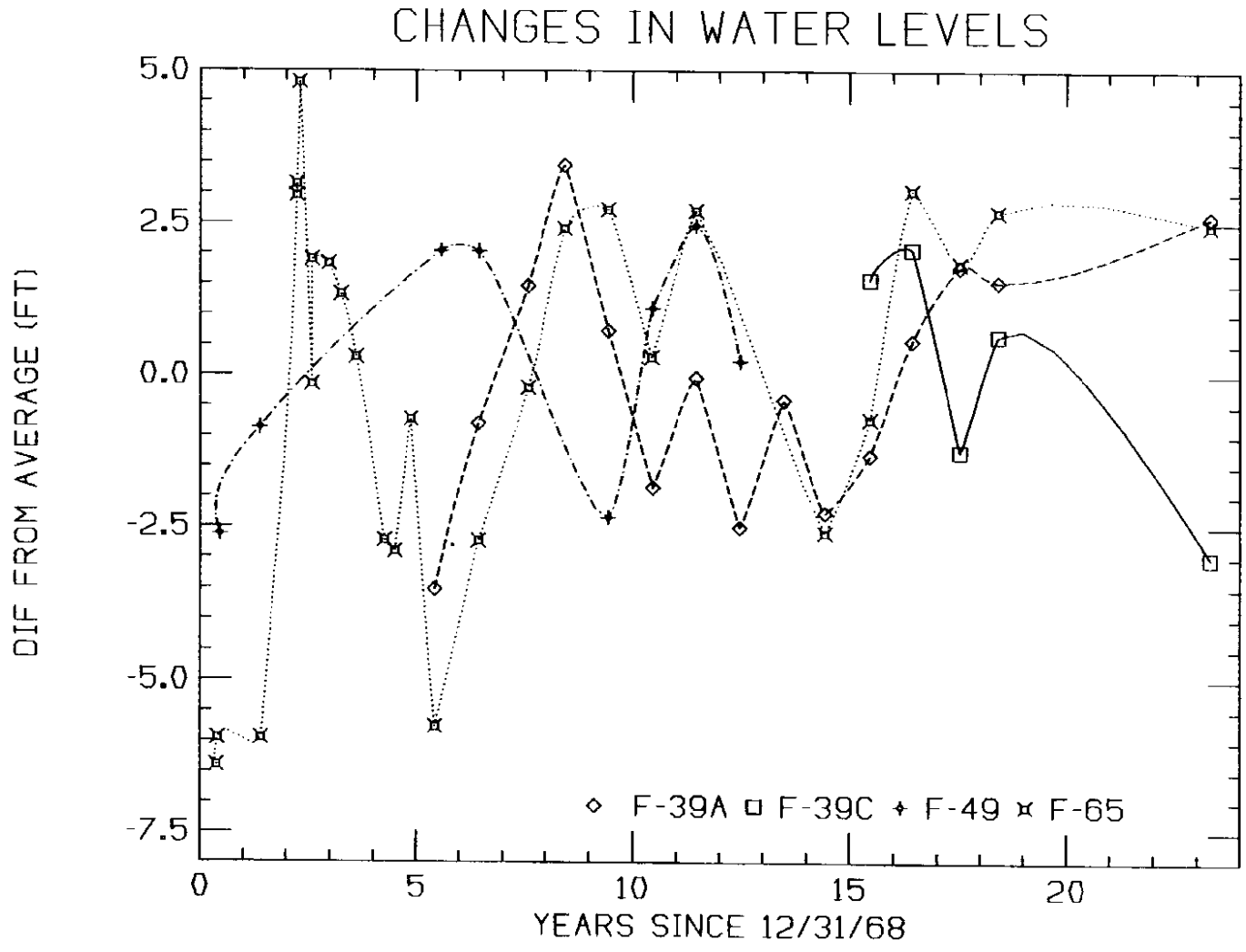
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
5.0
2.5
0.0
-2.5
-5.0
-7.5
0
5
10
15
20
YEARS SINCE 12/31/68
F-39A
F-39C
F-49
F-65

Fig. 5

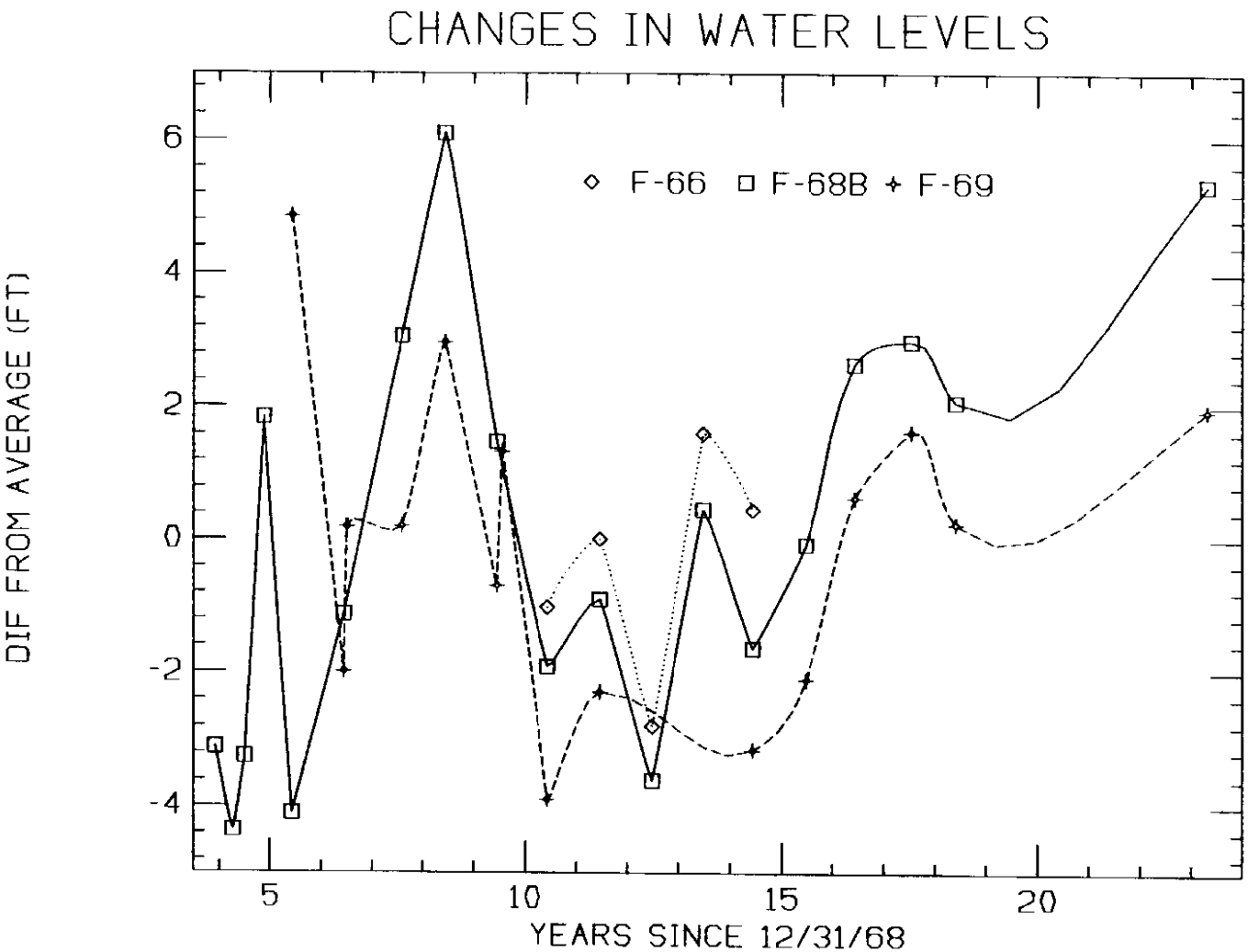
CHANGES IN WATER LEVELS
F-66
F-68B
F-69
DIF FROM AVERAGE (FT)
6
4
2
0
-2
-4
5
10
15
20
YEARS SINCE 12/31/68

Fig. 6

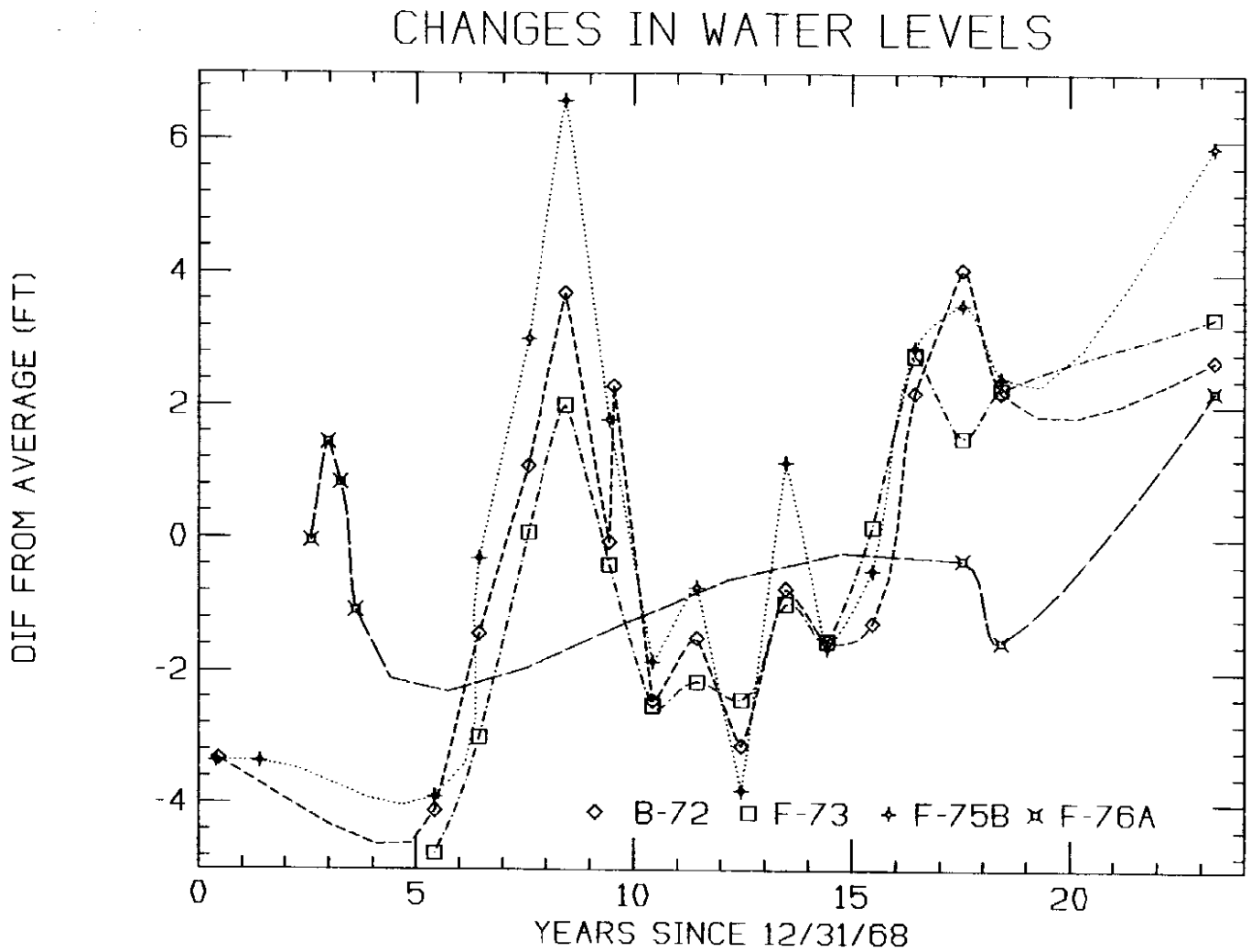
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
6
4
2
0
-2
-4
0
5
10
15
20
YEARS SINCE 12/31/68
B-72
F-73
F-75B
F-76A

Fig. 7

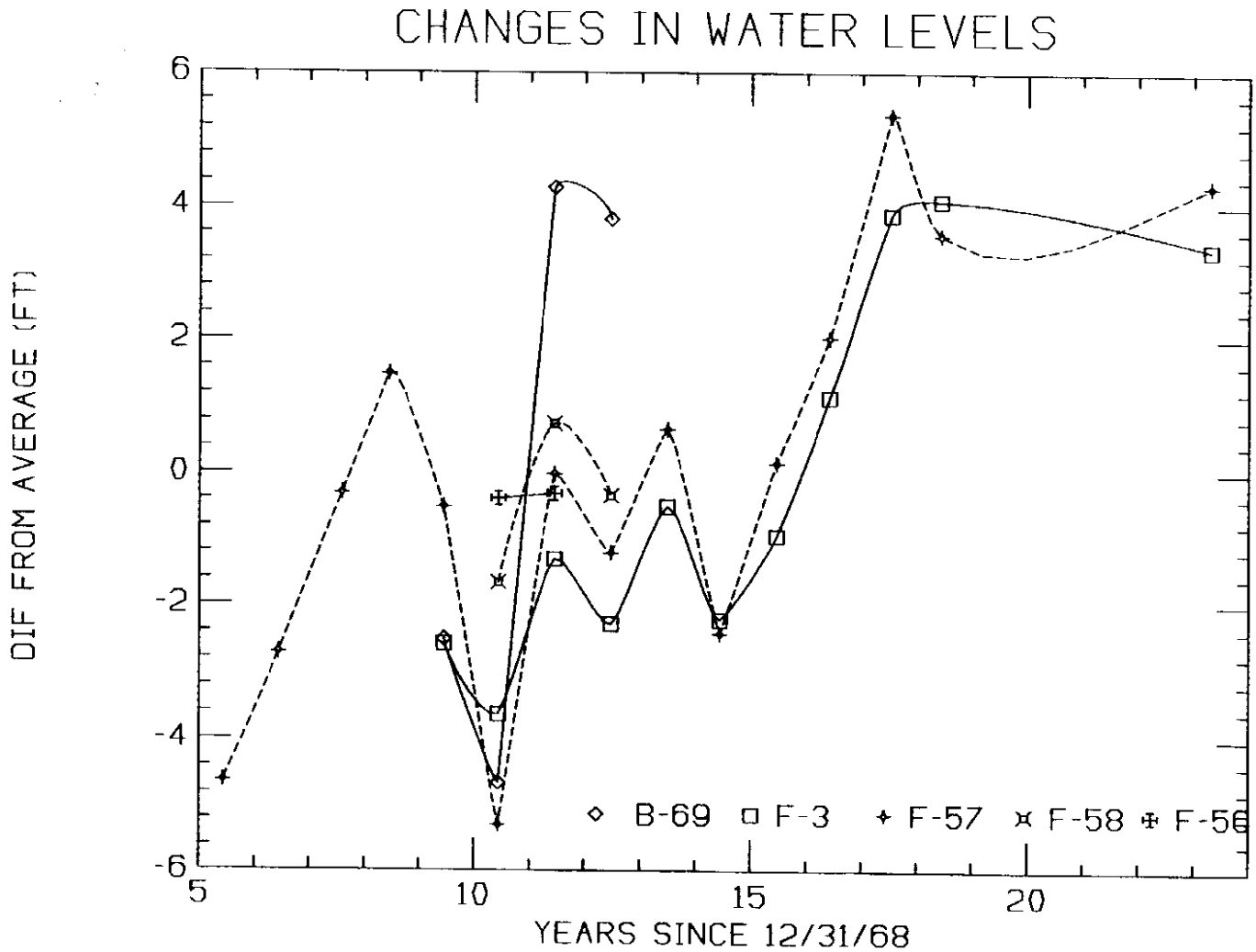
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
6
4
2
0
-2
-4
-6
5
10
15
20
YEARS SINCE 12/31/68
B-69
F-3
F-57
F-58
F-56

Fig. 8

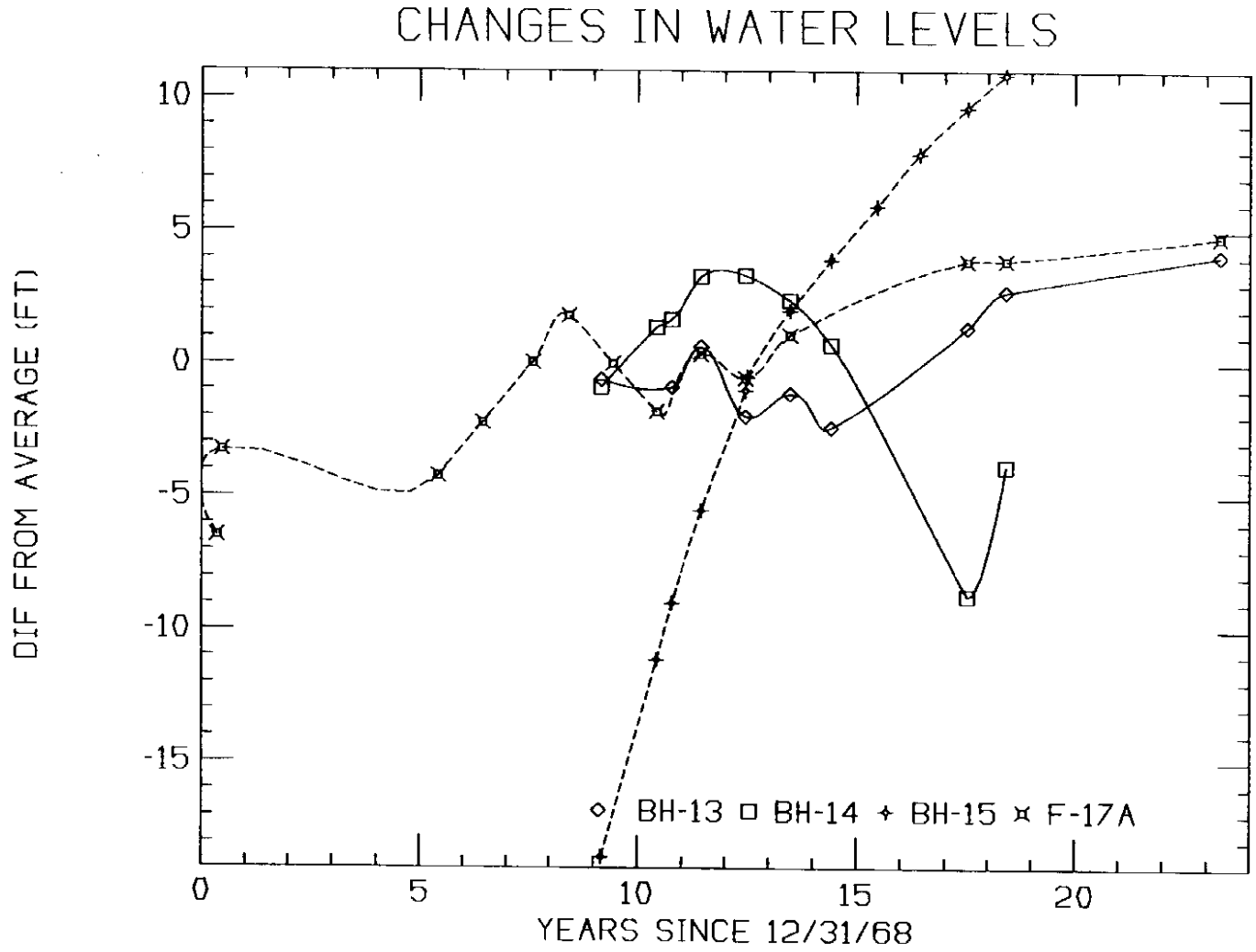
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
10
5
0
-5
-10
-15
0
5
10
15
20
YEARS SINCE 12/31/68
BH-13
BH-14
BH-15
F-17A

Fig. 9

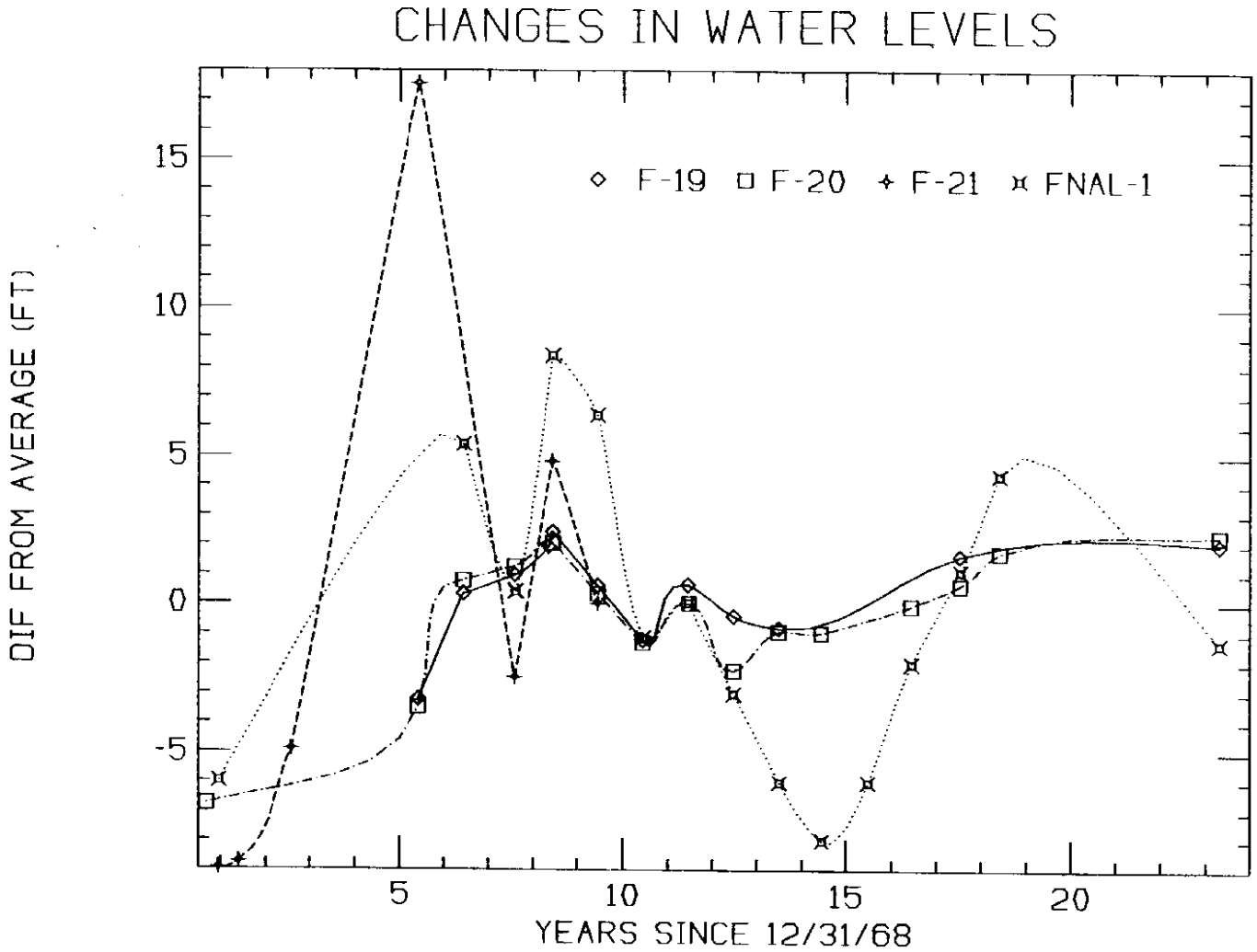
CHANGES IN WATER LEVELS
F-19
F-20
F-21
FNAL-1
DIF FROM AVERAGE (FT)
15
10
5
0
-5
5
10
15
20
YEARS SINCE 12/31/68

Fig. 10

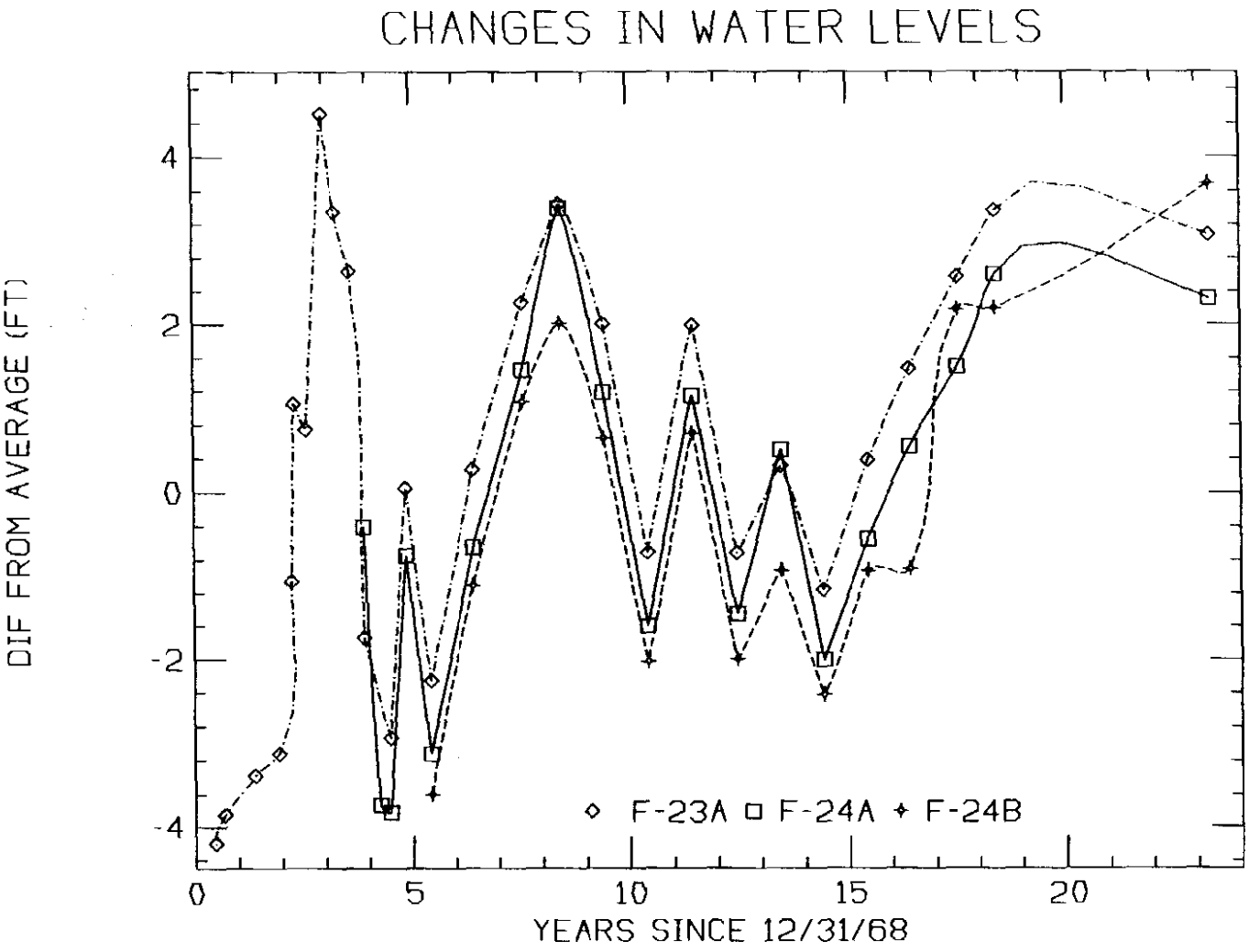
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
4
2
0
-2
-4
0
5
10
15
20
YEARS SINCE 12/31/68
F-23A
F-24A
F-24B

Fig. 11

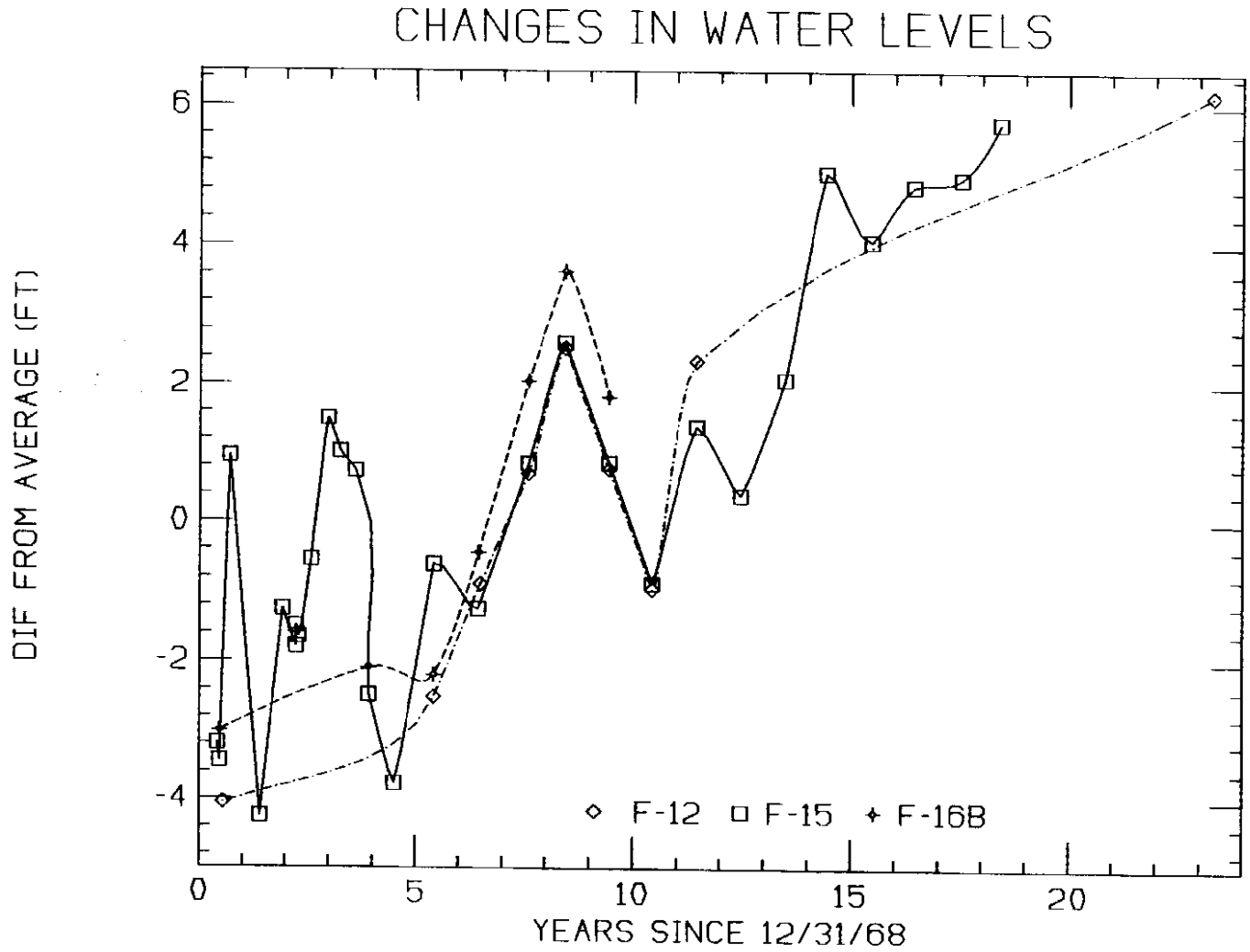
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
6
4
2
0
-2
-4
0
5
10
15
20
YEARS SINCE 12/31/68
F-12
F-15
F-16B

Fig. 12

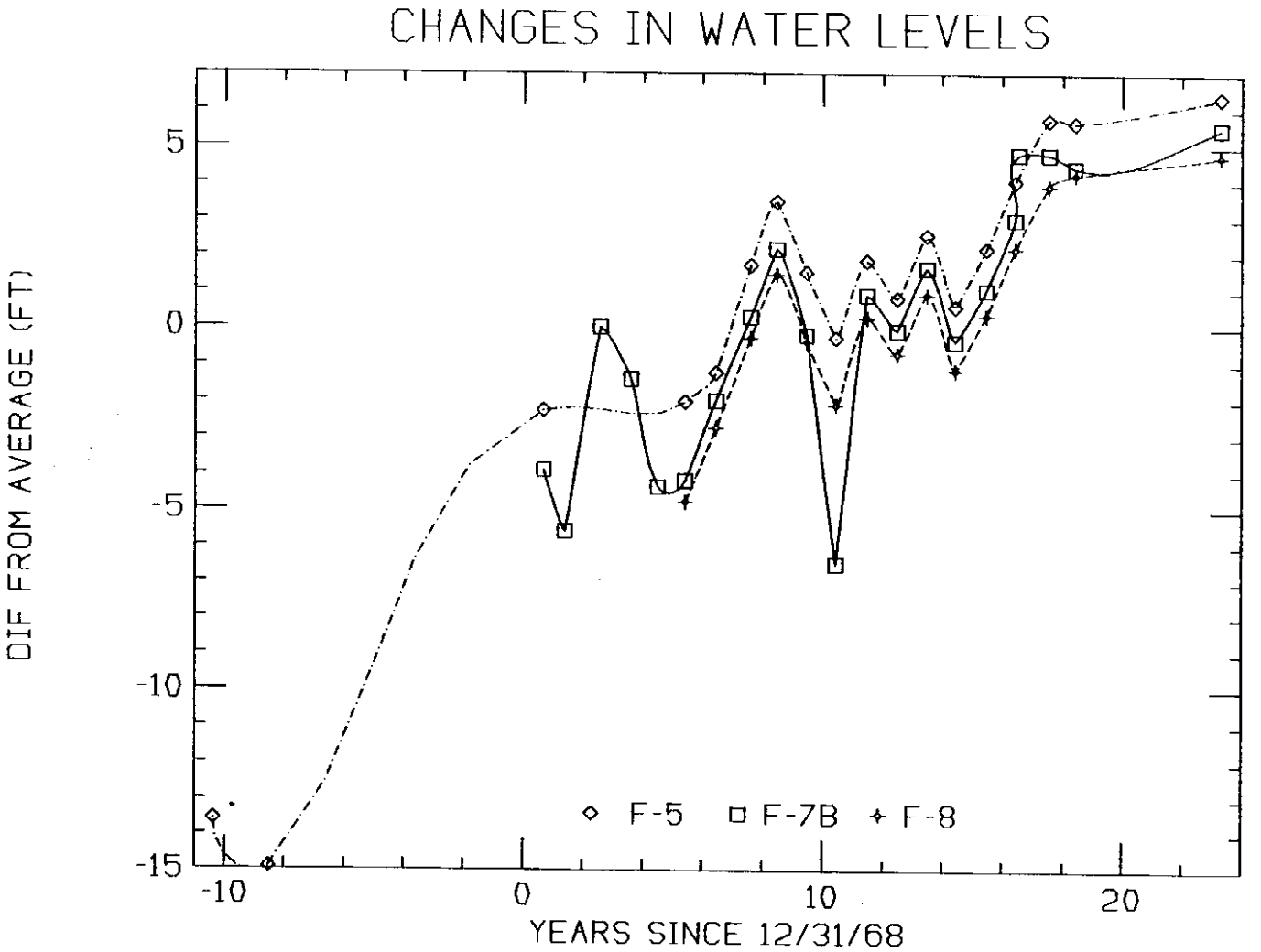
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
5
0
-5
-10
-15
-10
0
10
20
YEARS SINCE 12/31/68
F-5
F-7B
F-8

Fig. 13

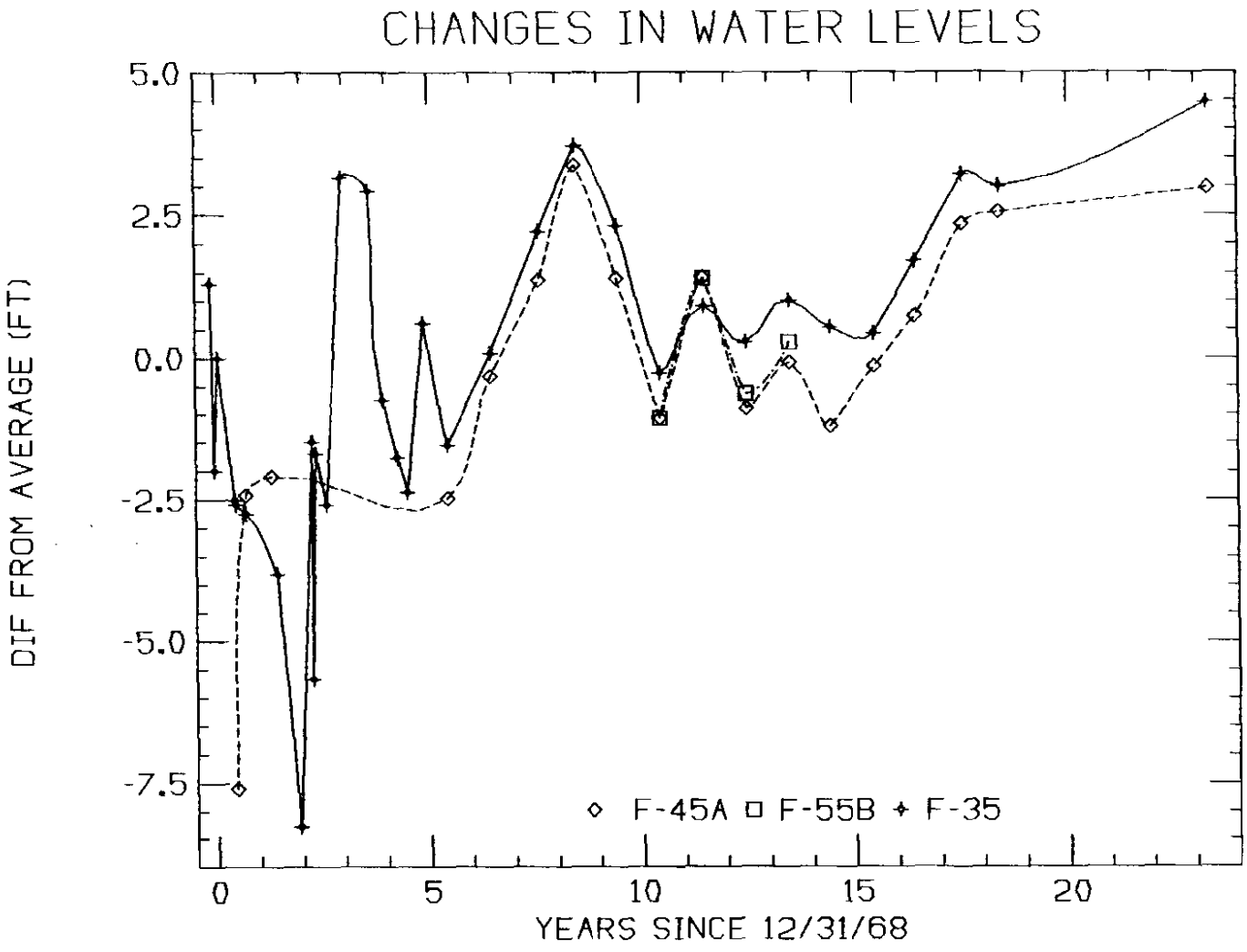
CHANGES IN WATER LEVELS
5.0
2.5
0.0
-2.5
-5.0
-7.5
DIF FROM AVERAGE (FT)
◇ F-45A □ F-55B + F-35
0
5
10
15
20
YEARS SINCE 12/31/68

Fig. 14

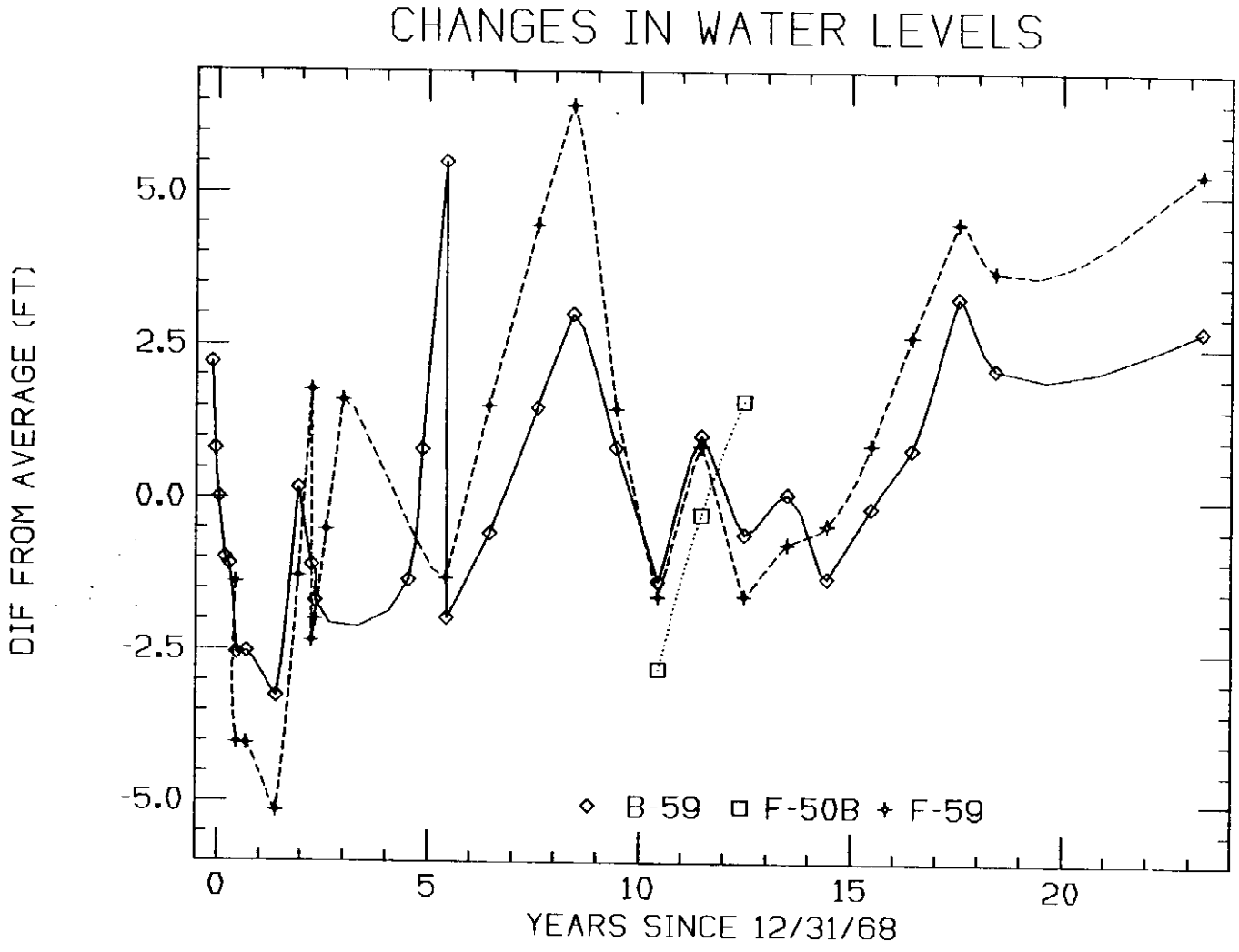
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
5.0
2.5
0.0
-2.5
-5.0
0
5
10
15
20
YEARS SINCE 12/31/68
B-59
F-50B
F-59

Fig. 15

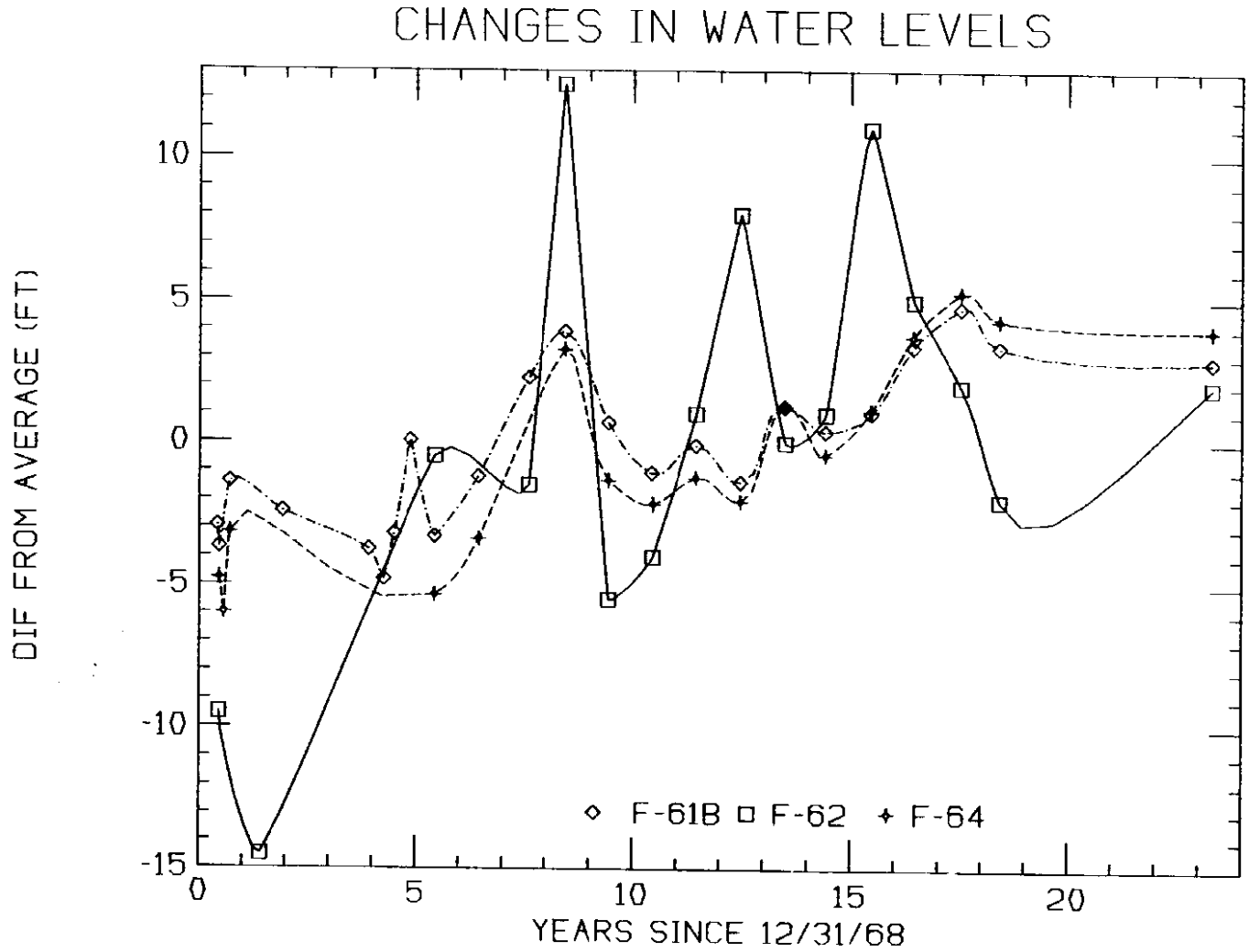
CHANGES IN WATER LEVELS
DIF FROM AVERAGE (FT)
10
5
0
-5
-10
-15
0
5
10
15
20
YEARS SINCE 12/31/68
F-61B
F-62
F-64

Fig. 16

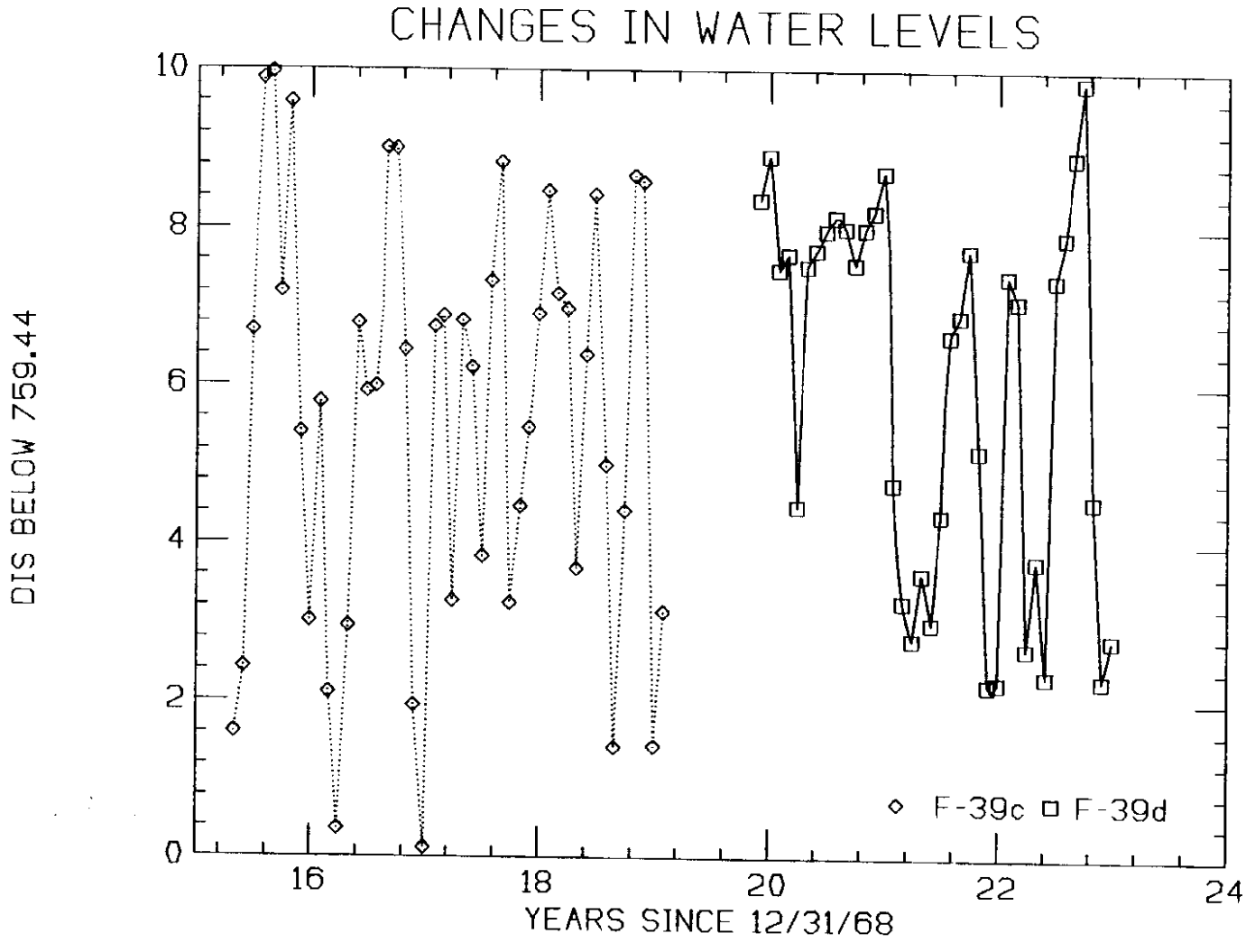
CHANGES IN WATER LEVELS
DIS BELOW 759.44
10
8
6
4
2
0
16
18
20
22
24
YEARS SINCE 12/31/68
F-39c
F-39d

Fig. 17